Being pregnant in rural South India

Nutrition of women and well-being of children

Inge Hutter

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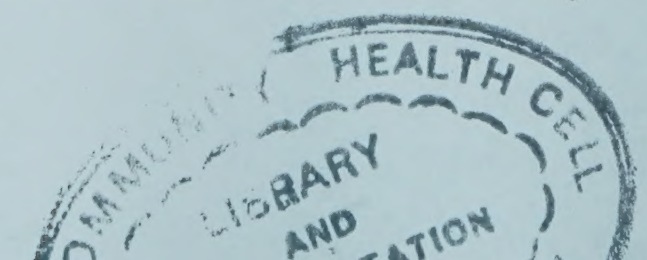
CIP-DATA KONINKLIJKE BIBLIOTHEEK, DEN HAAG

Hutter, Inge

Being pregnant in rural South India : nutrition of women and well-being of children / Inge Hutter. - Amsterdam : Thesis Publishers. - Fig., tab. -
With ref. - With summary in Dutch.
Subject headings: pregnancy ; South India / nutrition ; South India / medical anthropology ; South India.
ISBN 90-5170-306-6
NUGI 651/733

Technical editor: Joan Vrind, ITYP, Voorburg



RIJKSUNIVERSITEIT GRONINGEN

BEING PREGNANT IN RURAL SOUTH INDIA
nutrition of women and well-being of children

PROEFSCHRIFT

ter verkrijging van het doctoraat in de
Ruimtelijke Wetenschappen
aan de Rijksuniversiteit Groningen
op gezag van de
Rector Magnificus Dr. F. van der Woude
in het openbaar te verdedigen op
donderdag 20 oktober 1994
des namiddags te 4.00 uur

door

Inge Hutter
geboren op 20 februari 1959
te Oosterhesselen

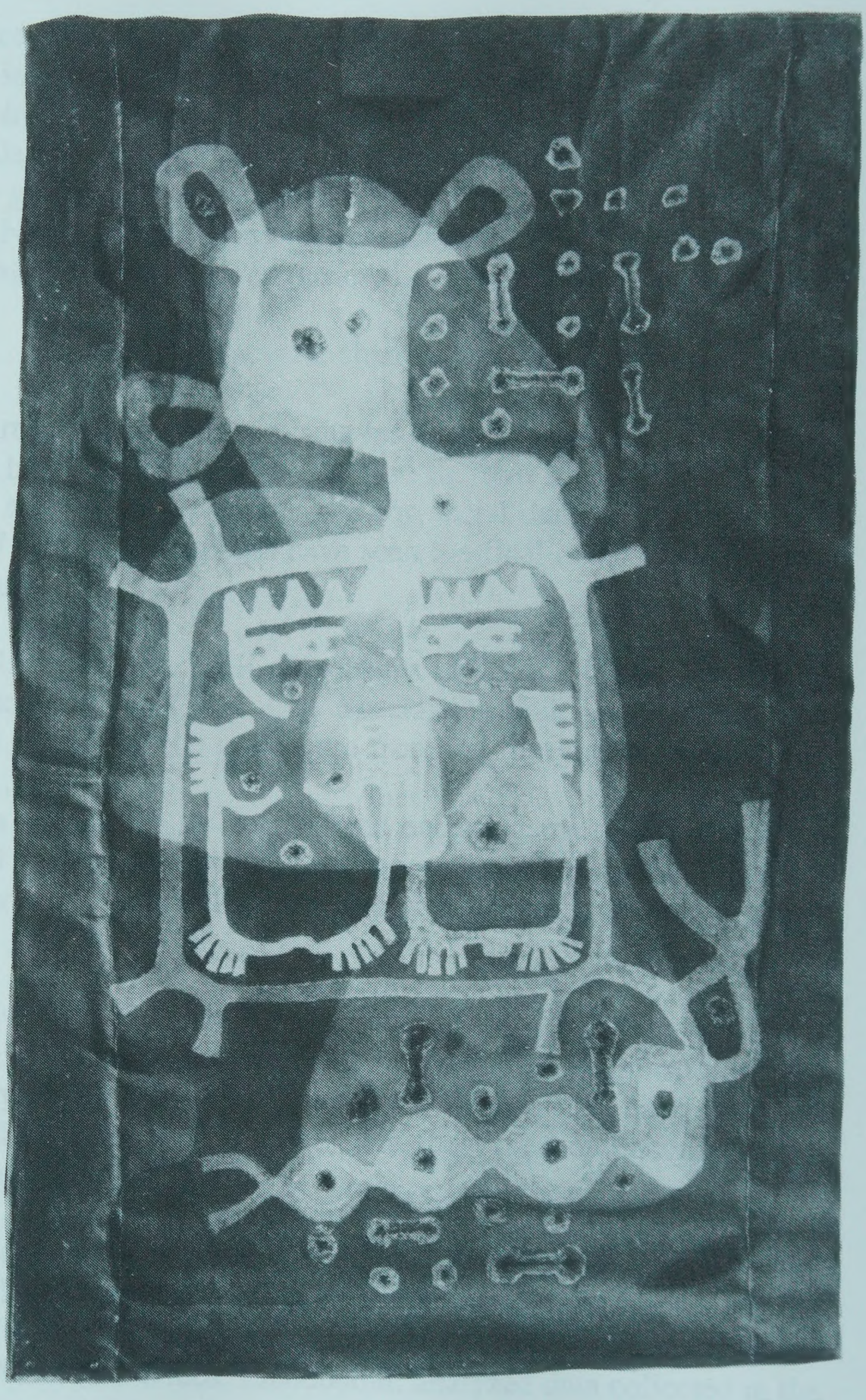
Promotores: prof.dr.ir. F.J. Willekens
: prof.dr. J.D. Speckmann

Toe-rings are worn, braid of jasmine garland
Big belly is seen, over the waist band!
Ain't you pregnant, angel-Laxmi
Ain't you pregnant, Laxmi-angel
What'en desire, you pregnant dear?

(Nuduva kalungara, mudiva mallige hara
Naduvina odyanadalli, odeda kanuttava hotte
Basarenavva Laxmadevi, basarenavva Laxmadevi
Baikenavva, premadinda)

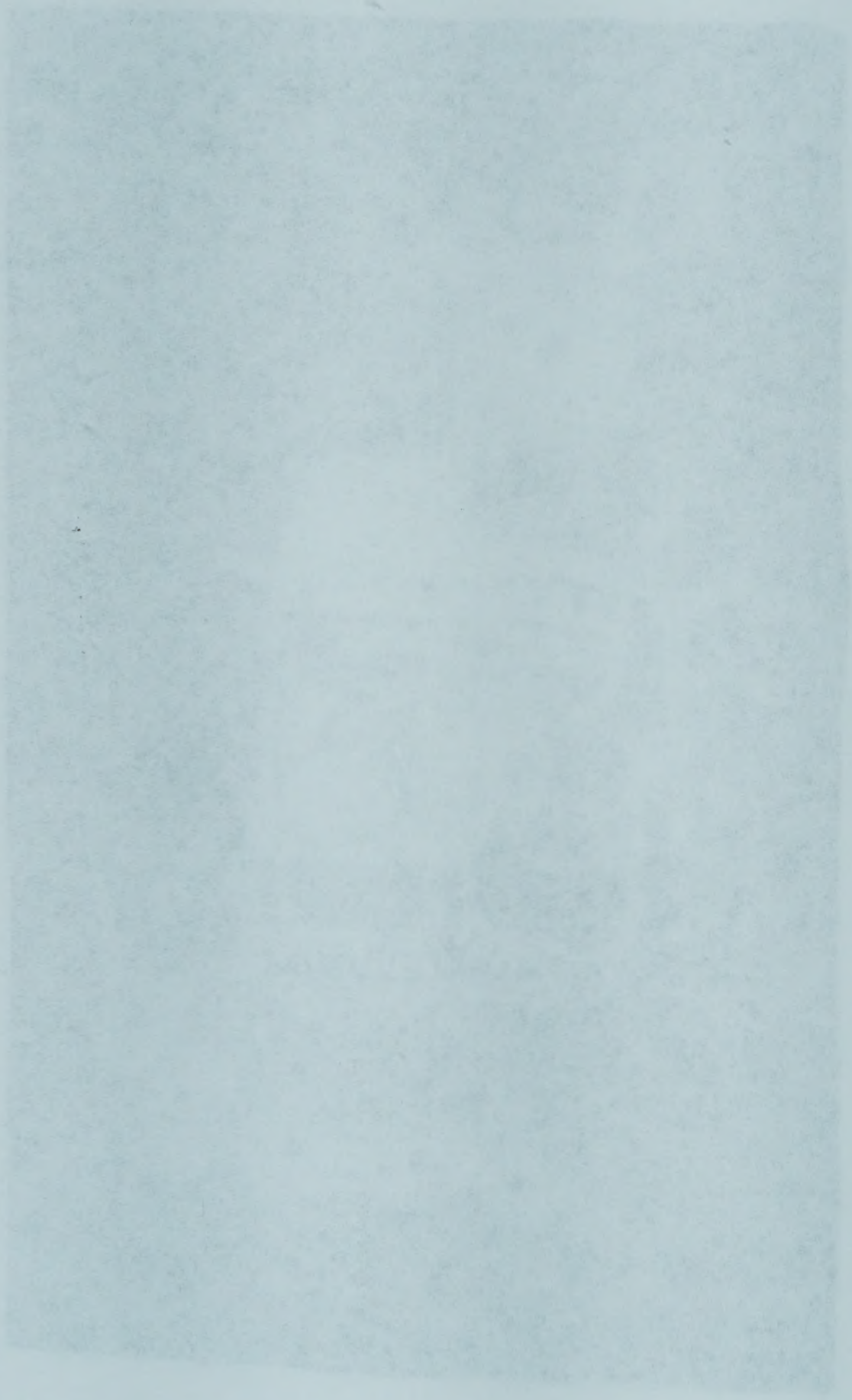
Part of the *soobhana*,
sung at the ceremony performed during the first pregnancy, the *kubasa*.

Translation: Arya



'Couple'

Painting: Arya
Photograph: Quita Pattist



Preface

In the course of a research project, one starts to contemplate on its history and the people who have played an important part in it. Actually, the research project described in this book commenced when I received -from an American organization- forms to participate in a competition of research proposals concerning the health and nutrition of mother and child in developing countries. When my guide at the department of demography of the University of Groningen, the late dr. Bert van Norren, heard of my plans to participate, he suggested I write a proposal about a common custom in developing countries, i.e. the reduction of food intake during pregnancy.
That is how the project started .... in later stages several changes and adaptations took place.

Bert van Norren played an important role: not only during his courses in social demography, but also through personal talks he stimulated me to combine the two scientific disciplines demography and anthropology. Moreover, his enthusiasm for social demographic research has been an inspiration for me. I only wish he could have seen the final result of the project which started under his guidance.

At the start of the project, the late prof. dr. W.F. Buschkens at Leiden University kindly offered his cooperation. Together with prof. dr. J.D. Speckmann and drs. H.A.W. van Vianen, he constituted the group of people who guided me from the first moments onwards.

I would like to thank Harrie van Vianen for his support and encouragement throughout the research period. He was involved in all stages: writing the proposal, conducting the feasibility study in Dharwad area in October 1989, and reading and commenting on the several versions of the manuscript.

Prof. dr. J.D. Speckmann (University of Leiden), prof. dr. J.A. Kusin (Royal Tropical Institute: KIT) and prof. dr. E.R. Boersma (University of Groningen) constituted the supervisory committee. I am very grateful for the support and guidance they have provided throughout the research period. Moreover, I would like to thank them for their encouragement and their confidence in this research project.

A few years ago, a research cooperation between the Department of Demography at the University of Groningen in The Netherlands and the nongovernmental organization (NGO) the India Development Service (IDS) at Dharwad in the state of Karnataka was established. Demography students, Henny de Vries and Wietze Lindeboom, analyzed data collected in the villages in which IDS conducts its activities. This research cooperation was reinforced in October 1989, when, with the help of this development organization, a feasibility study was conducted in Dharwad District. During the feasibility study also dr. P.H. Reddy from the Population Centre in Bangalore offered cooperation.

In the present project too, IDS has been very helpful: they introduced me in the research villages and helped me to find research assistants. I would like to thank Mrs. Shyamala Hiremath, dr. A.N. Kabur, R.B. Hiremath, the community organizers, the village health workers and all other people working with IDS. Their help has proven to be essential for the success of the fieldwork.

Moreover, I am grateful for the support given by the Karnatak University in Dharwad, Department of Anthropology. They kindly offered local guidance and library facilities. Prof. dr. Prabha V. Mahale acted as my local co-guide. Apart from assistance in the professional field, I enjoyed her friendship: I was always welcome in her house and in her family.

For the fieldwork, first of all I want to thank all the respondents who participated in the research project, especially the 186 pregnant women. I want to thank them for letting us measure, month after month, their weight, food intake, skinfold thickness etcetera, for answering so many of our curious questions and especially for letting us weigh the ones precious to them: their children.

Without the research assistants, this project could not have succeeded. I would very sincerely like to thank: Indraxi R. Kulkarni, Ningappa B. Khaironavar, Hema N. Khaironavar, Sunanda, Suddhakar S. Hosamani and Mrs. Hosamani, Shashikala B. Akki, Devendra F. Kotur and Gangavva Gh. Jiwaji. Apart from the work, they and their families shared part of their life with me. It is impossible to explain what they mean to me, but .... I will never forget the festival of Seegi Hunnime and Nagara Panchami which I celebrated in Veerapur with Gangavva and Devendra. Also, the wedding ceremonies of Devendra and his wife are unforgettable.

The trips on the red scooter together with Shashikala, waiting under the trees for the rains to stop and the talks and laughter we had are another sweet memory. I admire her courage to finish her bachelor course, in spite of all the constraints.

Indraxi (or Shalini as she is called by now) shared her family with me: the wooden figures, handmade by her father, which decorate our house in The Netherlands are only a material memento of their care.

During the census, it was Ningappa who wrote long stories on the census forms and who told me "if you really want to know Indian village life, you should take notice of this too". I am grateful for this and also for the discussions we had in his room about astrology, the *panchanga* and the medical system Ayurveda. When the nutritional survey started, the biggest surprise was that almost immediately one of the assistants joined the sample of pregnant women. Hema, Ningappa's wife turned out to be pregnant. I still remember our visits to the nursing home and especially the namegiving of their daughter Pooja. And lastly, the in-depth interviews in which Suddhakar acted as interpreter were most pleasant.

When I mention in this book that 'we' conducted the research, I refer to the whole research team (see photograph) which, besides the assistants, included the counterparts Anupama C. Angadi, Revathi S. Hosmath and H.K. Jayalakshmi. They collected the data on food intake, skinfold thickness and anaemia and estimated the nutritional values. I want to thank them for the huge amount of work they did. I especially thank Anupama who worked throughout the research period in a very sincere and competent way.

In addition, I want to thank the University of Agricultural Sciences, Home Science college, Department of Nutrition for their collaboration in providing the standard measures for the estimation of nutritional intake which they developed for this particular area of India.

I received private lessons in Kannada from Annapurna. I remember us sitting on the roof of her house, at seven o'clock in the morning. The smell of jasmine flowers — put straight from her garden into my hair, is still fresh in my memory.

It would be too much to mention everybody in Dharwad and elsewhere in India who showed me their hospitality. Let me mention a few and gratefully acknowledge the others. I am grateful to dr. and Mrs. Tavergeri and the members of their joint family: not only for their hospitality but also for the health care provided when needed. Others I want to mention by name are: my neighbours Maggy, captain, Sarita and Rosshini Samuel, and Suma, Suddhakar and Ajay Bailey; Dhilshaad, Simi and her family, and Anand and Vandana.

Beyond doubt, Mr. Arya's friendship has been very important to me. I lived with him in the same house in Dharwad, and like no-one else he saw the pleasure but also the sweat and the tears which accompanied the fieldwork. When I came home from the villages, is was he who listened to my stories about buffaloes attacking the scooter, white ants attacking my research papers, organizational problems to be faced, etcetera. Moreover, he shared his life and friends with me. Ever since the moment I received his first letter, in which he kindly offered the possibility to stay in his house, I had the heart-warming feeling that, somewhere in the middle of India, someone was waiting for me. Thanks, Arya, for giving me an Indian home.
I also want to thank Vasant Raichoor for everything he and his family, both in Dharwad and Paris, did for me. Our friendship made it easier to bridge the distance between India and Europe.

During my Ph.D. research, the Population Research Centre at the University of Groningen provided a very stimulating background and I want to thank my colleagues for this. Bart de Bruijn has been my closest colleague: working in the same room with him has been most enjoyable. And I want to thank Houkje de Boer for entering the census data in the computer.

I would like to thank my promoter, prof. dr. ir. Frans Willekens, for the funds he helped raise for this research and, moreover, for his encouragement and guidance. His three-day stay in Dharwad, the discussions we had about 'keeping distance', and the long train journey to Tirupathi are pleasant memories and will always remain in mind.

The maps and many of the figures in this book were prepared by Eric Runau and Theo Smit, whom I want to thank for the work completed in a short time period.
I would also like to thank Lieneke Hoeksma for the correction and enrichment of my English; and I am grateful to Joan Vrind who made this book camera ready and who, during the last months of this research project, took some of the burden from my shoulders.
Quita Pattist took the photograph of the painting: it was a very pleasant and joyful cooperation.

Most of this book was written on the attic of Harriet's house, and I want to thank her for being a close neighbour, for the talks, cups of tea, and glasses of port.

And, last but not least: I liked to make jokes about men writing their book and dedicating it to their wives and children ... and teased that I would dedicate mine, of course, to my husband. Well, dear Hans, here it is: without your help, support —and above all— love, crossing a distance of 160 kilometres (Enschede - Groningen) and 10,000 kilometres (Enschede - Dharwad), I would never have finished this book (as you know). Thank you ....

The research team

Under, from left to right: Hema N. Khaironavar, Gangavva Gh. Jiwaji, Shashikala B. Akki, Inge Hutter, Anupama C. Angadi, H.K. Jayalakshmi, and Indraxi R. Kulkarni
Above, from left to right: Devendra F. Kotur, Sudhakar S. Hosamani, and Ningappa B. Khaironavar
Missing in this photograph: Revathi S. Hosmath, Sunanda an mrs. Hosamani.

Contents

Chapter 1 Introduction

Recently, in May 1993, the World Health Assembly adopted a resolution on maternal and child health, and family planning for health, emphasizing the

> "elimination of harmful traditional practices and other social and behavioral obstacles affecting the health of women, children and adolescents".

It decries the persistence of practices

> "such as child marriages, dietary limitations during pregnancy and female genital mutilation"

and states that

> "such practices restrict the attainment of the goals of health, development and human rights for all members of society" (ESCAP, 1993).

This resolution, adopted by the World Health Assembly, comprises the main questions of this research project, which focuses on mother and child health in rural South India and dietary limitations during pregnancy.

Mother and child health in developing countries

In developing countries infant and child mortality has declined considerably during the last forty years, but the rates are still unacceptably high. While under-five mortality in the developed world nowadays amounts to 17 deaths per 1,000 live births, in the least developed countries rates as high as 180 deaths per 1,000 live births have been reported. In South Asian countries like India rates are lower, but still amount to 126 deaths per 1,000 live births (UNICEF, 1993).

In India, infant mortality, i.e. deaths in the first year of life, numbers 90 deaths per 1,000 live births (World Bank, 1993). Most of these infant deaths occur in the first month of life, the neonatal period. Within this period of one month, most deaths occur in the first week (UNICEF, 1991; WHO, 1991b). Causes of death in this perinatal period are related to pregnancy and delivery: two of the factors most commonly mentioned are prematurity and low birth weight.

While infant mortality in developing countries is around ten times as high as in industrialized countries, maternal deaths (deaths related to pregnancy and childbirth) are even one hundred times as high. In India, maternal mortality is commonly estimated to be 400-500 per 100,000 live births. However, due to underreporting an estimate of 800 per 100,000 live births seems to be more realistic (Jejeebhoy and RamaRao, 1992). In rural areas, rates as high as 1,360 per 100,000 live births have been reported (UNICEF, 1991). Given a total fertility (TFR) of four to five and a maternal mortality ratio of 500 per 100,000 live births, the lifetime risk of dying from pregnancy and child birth related causes for an Indian woman is one in 27 (Royston and Armstrong, 1989). The majority (75.0 per cent) of maternal deaths in India can be attributed to direct causes like haemorrhage, sepsis, abortion and toxaemia. Several studies indicate that more than 60 per cent of these maternal deaths are preventable. It is obvious that

the mortality rates among mothers and children only partially reveal the extent of the total of health problems related to pregnancy and childbirth.

A major conceptual framework guiding research on child health and child mortality in the past ten years is the one proposed by Mosley and Chen (1984). Important applications are the Demographic Health Surveys (DHS) which have been conducted in a large number of developing countries. Van Norren and Van Vianen (1986) extended and refined the model of Mosley and Chen (1984). Their model on the malnutrition-infections syndrome functions as the major conceptual framework of this research project. In this model, one of the intermediate variables affecting the biological risk factor 'constitution at birth' (which in turn is related to survival chances of children) is nutrition of the mother during pregnancy.

Dietary limitations during pregnancy

On the subject of nutrition during pregnancy, many customs and practices with regard to the quality of food intake have been reported in literature. In India, the taboo on the consumption of papaya during pregnancy is well-known: it is avoided because its heating quality is supposed to induce an abortion. Similarly, eggs are reported to be avoided because the child would be born bald.

With regard to the quantity of food, a common custom in developing countries is to reduce food intake during pregnancy, especially in the last trimester. Among other countries, this custom has been reported in Kenya (Kusin *et al.*, 1984; De Vries, 1987), Oman (Baasher, 1979), Ethiopia (Beddada, 1979), Sudan (El Shalazi, 1979), Iran (Djazayery *et al.*, 1992), Somalia (Ministry of National Planning and UNICEF, 1984) and India (Nichter and Nichter, 1983; Pool, 1983; Nichter, 1989; Hutter, 1990). In the nineteenth century, European women also tended to lower their food intake during pregnancy (Hytten, 1980b; Gelis, 1984). In general, the literature states that the reason behind this custom is that women hope to have a small child and thus an easy delivery (Hytten, 1980a; Ministry of National Planning and UNICEF, 1984; Kusin *et al.*, 1984; De Vries, 1987; Djazayery *et al.*, 1992).
Although the custom has been reported to exist in several developing countries, not much quantitative evidence of a reduction in food intake during the last trimester of pregnancy has been found. In the feasibility study conducted in the present research area, women too mentioned that they lowered food intake at the end of pregnancy, but we wonder whether they really did eat less. In other words, we wonder whether the reported reduction in food intake can be confirmed by quantitative data on food intake. Also, we wonder by how much intake is reduced during the last trimester of pregnancy and whether all women eat less during pregnancy.

A reduction in food intake contradicts international standards which recommend pregnant women to eat more than normal throughout pregnancy, i.e. an extra 285 kilocalories (kcal.) per day (FAO/WHO, 1985). This recommendation was formulated based on a theoretical total energy cost of pregnancy of 85,000 kcal. (Hytten and Leitch, 1971). In this theoretical model, women gain on average 12.5 kilograms during pregnancy while the average birth weight of children is 3.4 kg.

In India, most women reach neither the recommended level of energy intake nor the theoretical average weight gain and birth weight. The daily food intake of pregnant and lactating Indian women has been estimated to be deficient by about 1,000 kcal. (UNICEF, 1991). Average maternal weight gain amounts to six kg. only, and average birth weight to 2,700 grammes (UNICEF, 1991). The percentage of Low Birth Weight (LBW: < 2,500 grammes) children is one of the highest in the world, amounting to 30 per cent of all live births (Kramer, 1987).

Moreover, the nutritional status of most Indian women is poor even before pregnancy. This is not only due to poverty, but also to the status of women in Indian society. In general, girls receive less food than boys and women take their meals only after all other family members have finished theirs. In this research project we wonder what will happen if these women, whose nutritional status is already poor before conception, lower their food intake in the last trimester of pregnancy.

As mentioned above, the most commonly quoted reason for reducing food intake during the last trimester is that women hope to have a small child and thus an easy delivery. Some studies (Pool, 1983; Nichter and Nichter, 1983), however, go beyond this simple explanation and give an inventory of other more complex reasons. Nichter and Nichter (1983) conclude that the common explanation,

> "while relevant, tends to underestimate pregnant women's concern for the health of their babies"

and

> "tends to gloss over a complex of ideas associated with notions of ethnophysiology and preventive health" (Nichter and Nichter, 1983, p. 236).

In their research in South India, these authors found that most women associate a reduction in food intake in the last trimester of pregnancy with a big rather than a small child: if they eat too much there would not be enough room for the child to grow. In the feasibility study conducted in the research area too (Hutter, 1990), most women stated that if they ate less than normal during pregnancy the child would be big and healthy.
In this research project, we study more extensively the reasons behind the custom of eating less during the last three months of pregnancy, as perceived by women themselves.

Research questions

Let us return to the resolution adopted by the World Health Assembly to which we referred in the beginning of this introduction. The World Health Assembly mentions the practice of dietary limitations, an issue related directly to the main question of the research:

- *Can the reported reduction in food intake during the last trimester of pregnancy be confirmed by quantitative data on food intake?*
- *To what extent is food intake during the last trimester of pregnancy reduced?*
- *Do all women lower food intake during the last trimester of pregnancy or is the custom of reduction in food intake only practised by a particular group of women?*

The World Health Assembly identifies dietary limitations during pregnancy as a harmful practice. We explore whether a reduction in food intake during the last trimester of pregnancy is indeed harmful, and for who it might be harmful: for the mother, the child or for both? Moreover, we study whether it is more harmful among women who are already in a poor nutritional status before conception. Summarizing, the research project focuses on the following question:

> *What are the effects of a reduction in food intake during the last trimester of pregnancy among women whose nutritional status is already poor before conception on the health condition of women and pregnancy outcome?*

In addition, the World Health Assembly aims at elimination of the harmful practice of dietary limitations during pregnancy. However, a custom like the reduction in food intake during pregnancy can only be changed, if the reasons as perceived by the women themselves are known. In the second part of the research project, therefore, we focus on the question:

> *What are the reasons behind the custom of reduction in food intake in the last trimester of pregnancy, as perceived by women themselves?*

To answer these research questions, a fieldwork project was set up and carried out in a rural area (eleven villages) in Dharwad *taluk*, Dharwad District in the state of Karnataka, India.

Relevance of the research

In the present study, first the health situation of mothers and children in India is delineated (Chapter 2). For the health status of women in the reproductive period, maternal mortality partly reveals the extent of health problems related to pregnancy and child birth. For the health status of the child, we discuss the major conceptual framework on child mortality, the model of Mosley and Chen (1984). Extending and refining this model, Van Norren and Van Vianen (1986) formulated their model on the malnutrition-infections syndrome; the latter is the conceptual framework for this research project.

In addition, literature on nutrition during pregnancy, maternal weight gain and birth weight of children is reviewed in the same chapter. An important recently written review is the one published by the National Academy of Science (1990).

The large number of intervening variables —prepregnancy weight-for-height status and energy expenditure being the most important— confuses the study on the effects of food intake during pregnancy. Most researches therefore take only few variables into account. Here, we try to give *a more holistic picture of the course of pregnancy* by measuring not only nutrition during pregnancy, maternal weight gain, and birth weight of children, but also other indicators of nutritional status of women, like prepregnancy weight-for-height status and development of

skinfold thickness and mid-upper-arm circumference. Also, the use of antenatal services, compliance with iron tablets, tetanus injections and food supplementation, and prevalence of anaemia are discussed. Other variables included are physical activity during pregnancy and the reproductive history of the women (age, parity and birth interval).

Most research studies the effects of food intake during pregnancy on the birth weight of children. However, a study on birth weight alone as an indicator of well-being of the child is not satisfactory. Several studies have focused on weight gain in the first month of life and compared infants in industrialized societies with infants in developing countries. Although their average birth weight was lower, infants in developing countries appear to gain more weight (over 300 grammes more) and to catch up in weight after delivery. The difference was most obvious in the first days of life (Boersma *et al.*, 1988). In our research, we follow this research and measure *not only birth weight but also growth and development of children in the first month of life.*

Most studies of the relationship between nutrition during pregnancy, weight gain and birth weight are quantitative in character and do not pay attention to factors determining food intake during pregnancy. In our research, we include the latter topic as well. In the remainder of Chapter 2, we examine the possible factors —ecological, economic, physical, social, and cultural— related to the custom of reduction in food intake during the last trimester of pregnancy. The value-expectancy model of Fishbein and Ajzen (1975) offers a structure in which beliefs of both respondents and important others can be studied systematically and points of impact for future health education can be identified as well.

The scientific relevance of this research project, therefore, is that it not only studies the effects of a reduction in food intake among women whose nutritional status is already poor before conception on the health condition of the mother and well-being of the child, but also the reasons behind such a reduction in food intake. It is an *interdisciplinary approach* of the topic as both medical, nutritional, demographic, and anthropological aspects are included. Only in this way can a better understanding and explanation of the custom of reduction in food intake during the last trimester of pregnancy be achieved, and points of impact for future health education be formulated.

Contents of the study

Given these objectives of the research, methodologically a combination of *quantitatively and qualitatively oriented approaches* is needed (Chapter 3). Before starting the actual research project, we conducted a feasibility study (October 1989) to investigate whether research on this topic would be scientifically and socially relevant in this particular area of South India. Interviews were conducted with the help of a local Non-Governmental Organization (NGO) in Dharwad town, the India Development Service (IDS). The results of this feasibility study were positive and the actual fieldwork in the Dharwad District in Karnataka started in December 1990. The fieldwork period lasted 20 months, to August 1992.

We started the fieldwork with a census in the eleven research villages. The total population consists of more than 2,000 households and 12,000 individuals. Besides collection of background information about the research area, the main objective of the census was to gather

information on household composition in order to select women who might become pregnant in the forthcoming months. The actual research on nutrition during pregnancy started in May 1991. Data on food intake, weight gain, skinfold thickness, birth weight, etcetera were gathered through surveys. Information about beliefs regarding food intake during pregnancy was gathered through in-depth interviews, participant observation, and key-informant interviews.

Nutritional behaviour during pregnancy takes place within an economic, social, and cultural context. In Chapter 4 we describe these situational, economic, historical, social, and cultural aspects of the research area. Most data were collected through the census, key-informant interviews and participant observation. A literature study completes the information. The settlement pattern of the research villages, their historical background, the religious and caste system, the medical system Ayurveda, the marriage system, and status of women are some of the subjects described.

The actual study population consisted of 186 pregnant women. They are described in Chapter 5. A distinction is made between characteristics prevalent before pregnancy and characteristics prevalent during pregnancy. With regard to the first, individual characteristics like the reproductive history and prepregnancy weight-for-height status but also socio-economic characteristics like type of family and socio-economic position of the household are discussed. These maternal factors constitute the starting position of the child. In the second category (characteristics prevalent during pregnancy), the use of antenatal services, compliance with tetanus injections, iron tablets and food supplementation are discussed. The custom of sending pregnant women to the house of their own parents for delivery, the custom of (dis)continuation of breastfeeding during pregnancy and physical activities during pregnancy are also depicted in this chapter.

The background variables related to food intake during pregnancy have been described in the previous chapters. In Chapter 6, we focus on the analysis of the effects of food intake on the health condition of the mother and well-being of the child. Data on energy intake during pregnancy and its effects on maternal weight gain, skinfold thickness, mid-upper-arm-circumference, and birth weight of children are presented. In the last section, the development of children in the first month of life is included.

Information about the beliefs of women themselves on quantity and quality of food intake during pregnancy are presented in the next chapter (Chapter 7). Following the model of Fishbein and Ajzen (1975), beliefs of important others and motivation of respondents to conform to them are included. In the last section, beliefs with regard to other proper behaviour during pregnancy are referred to.

In order to get a more complete picture of maternal nutritional behaviour we subsequently consider the beliefs regarding food behaviour in the child's first month of life (Chapter 8). Beliefs in this period are related either to health of the mother or to the health of her baby. Information about deliveries and the role of traditional birth attendants is also presented here. The final conclusions and a discussion of the results are presented in Chapter 9.

Chapter 2 Theory and facts

In Chapter 1 we formulated the research questions. In brief, referring to the last two research questions, we want to investigate the effects of a reduction in food intake during the last trimester of pregnancy among women whose nutritional status is already poor before conception on the health condition of women and pregnancy outcome. In addition, we want to study the reasons behind a reduction in food intake. In this chapter, we present some facts about maternal and child health in India and review several studies on nutrition during pregnancy.

First, we delineate the health situation of mothers and children in developing countries, in particular in India. Maternal deaths reveal some of the health problems faced by women in the reproductive period. Maternal mortality, i.e. deaths related to pregnancy and child birth, and its determinants are described in Subsection 2.1.1.

A major conceptual framework guiding research on child health and child mortality in the past ten years is the one proposed by Mosley and Chen (1984). An important application, for example, are the Demographic Health Surveys (DHS) which have been conducted in a large number of developing countries. Van Norren and Van Vianen (1986) extended and refined this model (Subsection 2.1.2). Their model on the malnutrition-infections syndrome functions as the major conceptual framework for the present research project. We introduce a differentiation in the model and divide the period of child mortality (mortality of under-fives) into three different periods, each displaying its own morbidity and mortality pattern. We distinguish the neonatal period (first month of life), infancy (one month to one year), and post-infancy (one year to five years). Given the topic of research, we subsequently focus on the neonatal period and derive from the model of Van Norren and Van Vianen (1986) the variables which are relevant for our research. We take into account the biological risk factor 'constitution at birth' (which is related to survival chances of children) and the proximate determinants 'reproductive pattern', and 'nutrition of the mother during pregnancy'.

Data on neonatal and perinatal mortality rates in India, and their determinants are presented in Subsection 2.1.3. Subsequently, the risk factor 'constitution at birth', as derived from the model of Van Norren and Van Vianen (1986), is discussed (Subsection 2.1.4). Birth weight is governed by two major processes: duration of gestation and intrauterine growth rate. Low birth weight is therefore caused either by a short gestational period, intrauterine growth retardation (IUGR) or a combination of the two. Studies on two of the factors contributing to IUGR, i.e. nutrition and weight gain during pregnancy, are extensively reviewed in the following section (Section 2.2).

The relationship between nutrition during pregnancy, maternal weight gain and birth weight of children can be distorted by several intervening variables. The most important ones, energy expenditure and physical activity during pregnancy, and prepregnancy weight-for-height status, are described in Section 2.3.

After this extensive review, we focus on the effects of a reduction in energy intake on the health condition of the mother and pregnancy outcome (Section 2.4).

The literature suggests that birth weight alone is not a sufficient indicator of well-being of the child and in the research project we therefore take growth and development of the child in the first months of life into account (Section 2.5).

In Section 2.6, we focus on the determinants of a reduction in food intake during the last trimester of pregnancy. We examine the factors possibly related to this custom. Based on the literature, we expect ecological, economic, and physiological reasons to play a minor part. We expect the reasons behind the custom to be culturally and socially determined. As a consequence, we elaborate on beliefs of the women themselves about food intake during pregnancy and the influence of important others. Moreover, these variables are integrated in a model on nutritional behaviour during pregnancy, a model based on the value-expectancy model of Fishbein and Ajzen (1975).

2.1. Maternal and child mortality in developing countries

Infant and child mortality in developing countries has declined considerably during the last forty years, but the rates are still unacceptably high. While the under-five mortality rate in the developed world amounts to 17 deaths per 1,000 live births, in the least developed countries rates as high as 180 deaths per 1,000 live births have been reported. In South Asian countries like India rates are lower but still amount to 126 deaths per 1,000 live births (Robey *et al.*, 1992; UNICEF, 1993).

While infant mortality in developing countries is around ten times as high as in industrialized countries, maternal deaths are even hundred times as high (Winikoff, 1988; McCarthy and Maine, 1992). Maternal mortality in western Europe fluctuates around 10 per 100,000 live births. South Asian countries have one of the highest figures: over 600 maternal deaths per 100,000 live births. In the following sections, we delineate the health situation of both mothers and children in India.

2.1.1. Maternal mortality

This research project considers the effects of a reduction in energy intake during pregnancy on the health condition of the mother. Some of the health problems faced by women in the reproductive period are indicated by maternal mortality which includes maternal deaths due to pregnancy and child birth.

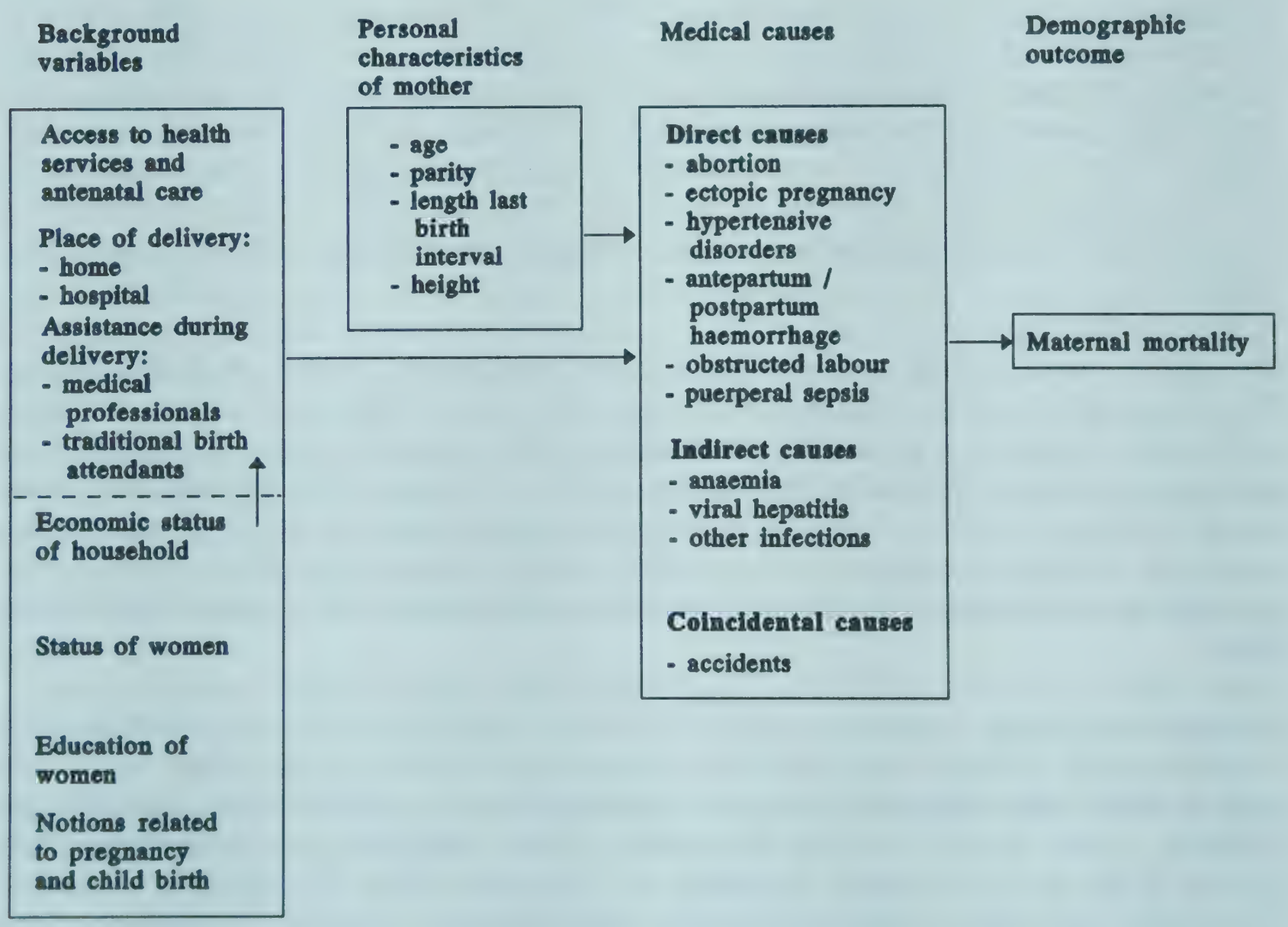
In India, maternal mortality is commonly estimated to be 400-500 per 100,000 live births (UNICEF, 1991). But due to underreporting, an estimate of 800 per 100,000 live births seems to be more realistic (Jejeebhoy and RamaRao, 1992). In rural areas rates as high as 1,360 have been reported (UNICEF, 1991). Given a total fertility (TFR) of four to five and a maternal mortality ratio of 500 per 100,000 live births, the lifetime risk of dying from pregnancy and child birth related causes for an Indian woman is one in 27 (Royston and Armstrong, 1989).

Medical causes of maternal mortality are divided into direct, indirect and coincidental (see Figure 2.1). Direct causes are diseases or complications which occur only during pregnancy and child birth: abortion, ectopic pregnancy, hypertensive diseases of pregnancy, antepartum, and postpartum haemorrhage, obstructed labour and puerperal sepsis. Indirect causes are diseases which may be present before but are aggravated by pregnancy, for example anaemia or diabetes. Coincidental causes are factors not especially related to pregnancy: accidents for example (WHO, 1991a).

In India, the majority (75.0 per cent) of maternal deaths are attributed to direct causes such as haemorrhage, sepsis, abortion, and toxaemia. An important indirect factor is anaemia, accounting for 15-20 per cent of maternal deaths. Another indirect cause is viral hepatitis (Mathai, 1989; Jindal *et al.*, 1989).

These medical causes are related to maternal characteristics. High risk pregnancies are more likely to occur among very young (< 20 years) and older women (> 35 years), among first parity and higher parity (> 3) women and among women with a short last birth interval. A community study conducted in Maharashtra (c.f. WHO, 1991a) shows the influence of age. It reports a maternal mortality of 334 per 100,000 live births for women younger than 20 years

Figure 2.1. Determinants of maternal mortality in developing countries



Derived from WHO (1991a).

and 395 per 100,000 live births for women older than 30 years, whereas maternal mortality amounts to 205 per 100,000 live births only in the age group of 20-29 years. Another important factor is the mother's height.

Several studies (Roy Chowdury and Sikdar, 1982; Panat and Mehendale, 1987) indicate that most maternal deaths are preventable, stating percentages ranging from 60 to 80. With regard to the development of maternal mortality over time, studies conducted in hospitals in Bombay (Damania *et al.*, 1989), Madras (Beebi, 1987), and Haryana (Tewari and Gulati, 1990) indicate a gradual decline.

The background factors related to maternal mortality are also depicted in Figure 2.1. Access to health services and antenatal care is important. Lack of transport facilities might prevent pregnant women visiting health services or hinder immediate referral in case of emergencies and acute complications during delivery. Economic, social and cultural factors also determine accessibility of health services and antenatal care. The place of delivery (in hospital or at home) and the kind of assistance provided (medical professionals or traditional birth attendants) are also variables associated with maternal mortality. These background variables, in turn, are related to economic status of the household, education of women, status of women, and notions regarding pregnancy and delivery.

2.1.2. Child mortality

One of the most important models structuring the determinants of child survival in developing countries is the one constructed by Mosley (1983) and Mosley and Chen (1984), aiming at the measurement of the effectiveness of Primary Health Care interventions. The authors try to integrate the medical and social science approaches to child mortality. The medical approach traditionally focuses on the biological processes of disease, morbidity being the dependent variable, and the influence of socio-economic factors is often ignored. The social science approach commonly studies the association between socio-economic variables and patterns or levels of child mortality without being able to explain the relationship (Mosley and Chen, 1984).

One of the premises of the model of Mosley and Chen (1984) is that in an optimal setting, 98 per cent of all newborn infants can be expected to survive the first five years of life. A reduction in this survival probability in any society is due to social, economic, biological, or environmental forces. Following the model on fertility of Bongaarts and Potter (1983), in the model of Mosley and Chen (1984) socio-economic and environmental factors operate through some basic biological mechanisms, the so-called proximate determinants. These, in turn, affect the risks of morbidity and consequently the outcome of the morbidity process: survival or death.

An important concept in studies on survival chances of children in developing countries is the 'road to health', in which the growth and development of children is monitored. In fact, the road to health will commence at the time of conception. In addition to fetal mortality and stillbirths, other factors related to intrauterine growth and development determine child survival in the period after birth, especially the first month of life. During infancy (the first year of life) and childhood (up to five years), mortality is usually not the consequence of one single infection or disease, but the result of multiple consecutive morbidity states. Mal-

nutrition, often beginning after weaning, makes children more vulnerable for infections. On the other hand, children who are living in poor hygienic conditions will get an illness more frequently and -while sick- are more likely to eat less and become malnourished. The dependent variable in the conceptual model of Mosley and Chen is therefore firstly the complex of malnutrition-infections, and secondly survival or death of the child. Socio-economic factors affect these dependent variables only through proximate determinants (Mosley, 1983, p. 46).

Van Norren and Van Vianen (1986) extended and refined the model of Mosley and Chen. The authors amended three shortcomings of the latter model:

1. In Mosley's model the intermediate variables are purely biological. In the new model they are both behavioural and biological in kind.
2. In Mosley's model the levels of the mother and the child are merged, in that some intermediate variables refer to the mother, others to the child. In the new model the two levels are separate.
3. In Mosley's model the various types of health-related practices are not further specified. In the new model they are (Van Norren and Van Vianen, 1986, p. 7).

The model of Van Norren and Van Vianen (1986) on the malnutrition-infections syndrome and its demographic outcome in developing countries is presented in Figure 2.2.

Five levels can be distinguished in the model. The malnutrition-infections syndrome and its demographic consequences (survival or death) are the two dependent variables. The proximate determinants are both biological and behavioural in character and are "susceptible to Primary Health Care (PHC) interventions and are preferably an item of priority in these PHC programs" (Van Norren and Van Vianen, 1986, p. 9).

The five groups of proximate determinants affect the malnutrition-infections syndrome through four purely biological risk factors, which "constitute an eclectic reformulation of elements of three models" (Van Norren and Van Vianen, 1986, p. 9), i.e. those of Mosley (1985), Hilderbrand *et al.* (1985), and Garenne and Vimard (1984). The four risk factors consist of physical constitution at birth, exposure to infectious agents, susceptibility to infections, and nutritional intake. Finally, household characteristics and, as added in a later version of the model (Van Norren, 1988), community and programmatic characteristics operate through the intermediate variables and risk factors.

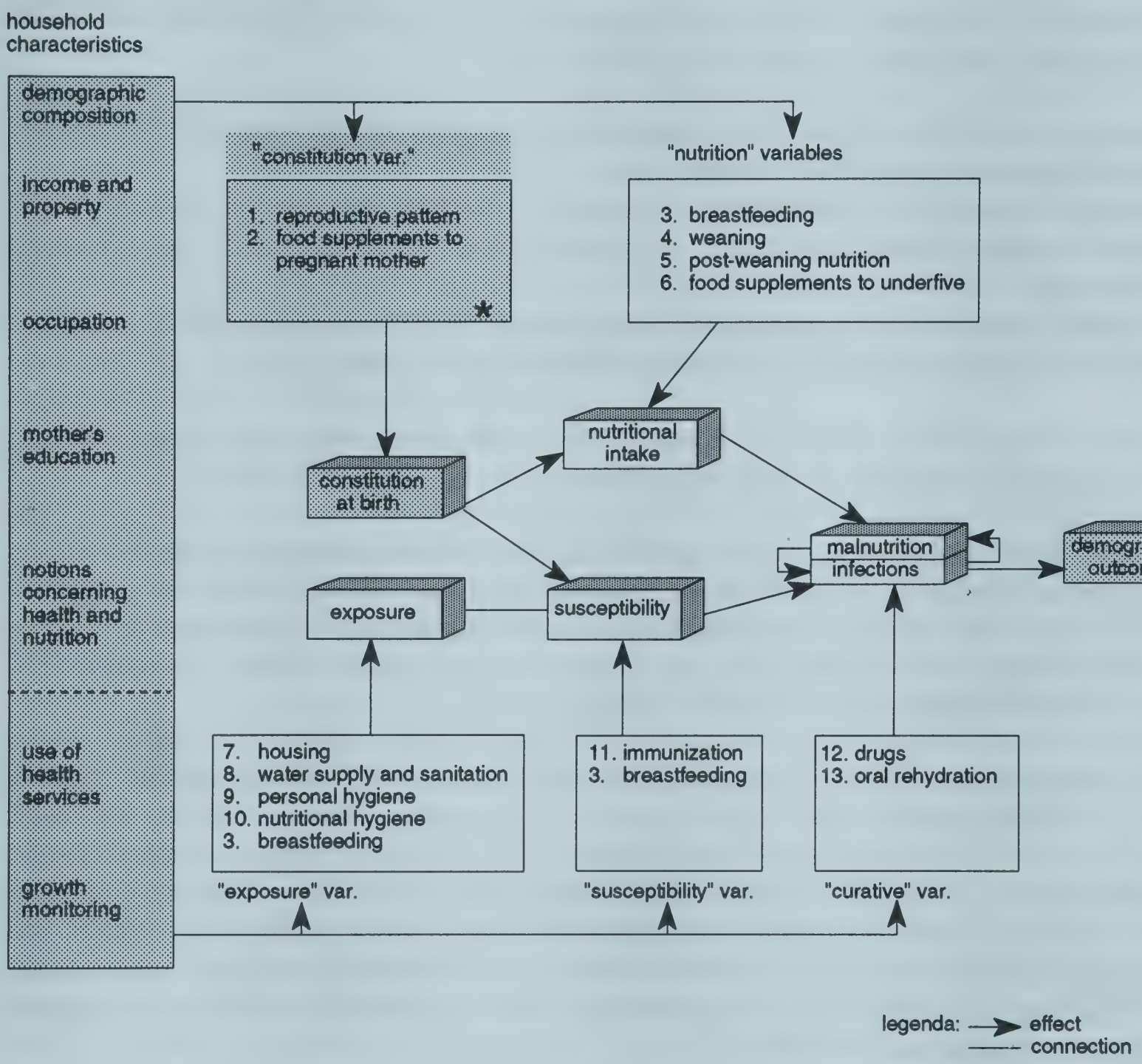
Clearly, the model is too complex to be studied in total but is meant to function as a framework for

> "partial 'causal' studies of infant and child mortality" (Van Norren and Van Vianen, 1986, p. 13).

The model has been used and evaluated by several researchers (Feachem *et al.*, 1989; Bicego and Boerma, 1991; Hill, 1992).

Here, we want to reduce its complexity by distinguishing different time periods. The conceptual model encompasses a broad time span: the first five years of life. We shall break this down into periods, each displaying its own morbidity and mortality pattern. Like in the model of Barnum and Barlow (1984), we discern the neonatal period (first month of life), infancy (one month to one year of life), and post-infancy period (one year up to five years).

Figure 2.2. The malnutrition-infections syndrome model



* In a later version of the model (Van Norren, 1988), immunization of the mother during pregnancy was added.
Source: Van Norren and Van Vianen (1986, p. 11).

In the neonatal period the malnutrition-infections syndrome is not yet important (see below). The only dependent variable in the model is therefore survival or death of children (neonatal mortality). For survival in this first month of life, constitution at birth, related to the constitutional proximate determinants of the reproductive pattern of women (age, parity and length of last birth interval) and nutrition and immunization during pregnancy are important. For the development of the child, breastfeeding is important. In infancy, the malnutrition-infection syndrome starts to play a role, especially from the moment that children receive supplementary food. In this period, the risk factors nutritional intake, susceptibility, and exposure, influenced by the related proximate determinants play an important role. In the post-infancy period, the influence of the proximate variable breastfeeding slowly declines while the share of others increases.

Given the topic of research, it is evident that we shall focus on the neonatal period. To illustrate how our research fits in the model of Van Norren and Van Vianen (1986), the variables which are relevant for our research are accentuated in Figure 2.2.

In the following subsections, we first take a closer look at neonatal and perinatal mortality, and their determinants in India. In the next section, we elaborate on the risk factor, identified in the model of Van Norren and Van Vianen (1986) as 'constitution at birth'.

2.1.3. Facts: neonatal and perinatal mortality in India

Under-five mortality in India amounts to 126 deaths per 1,000 live births, while the infant mortality rate (IMR) amounts to 90 per 1,000 live births (World Bank, 1993). In the state of Karnataka, the IMR amounts to 72 per 1,000 live births. In the rural areas, the IMR is higher (83 per 1,000 live births) than in the urban areas which show an IMR of 46 deaths per 1,000 live births (data for 1988).

Most deaths in the first year of life occur in the neonatal period (WHO, 1991b). In India, about 60 per cent of all infant deaths take place in the first month of life (data from the Registrar General as quoted by UNICEF, 1991). The neonatal mortality rate for India is estimated to be 58 deaths per 1,000 live births (data for 1987). In rural Karnataka, neonatal mortality rates of 62 per 1,000 live births have been reported (Badari *et al.*, 1991).

Within this period of one month, most deaths take place in the first week of life. In a hospital in Delhi, 81 per cent of all neonatal deaths occurred in the first seven days of life (Singh *et al.*, 1991). In the state of Harijana, a percentage of 73 has been reported (Singhi *et al.*, 1989).

These deaths, added to stillbirths, make up the perinatal mortality rate (PNMR), defined by the WHO (1991b) as

> "late fetal deaths or stillbirths ($\geq$ 28 weeks of gestation or $>$ 1,000 grammes) and early neonatal deaths (deaths in the first week of life)".

Estimates of the PNMR in India vary widely. The national rate amounts to 64 deaths per 1,000 live births (World Bank, 1993). In Karnataka, a PNMR of 57 deaths per 1,000 live births has been reported and for the rural areas, 65 per 1,000 (UNICEF, 1991).

Hospital-based studies, conducted all over the country, report estimates of a PNMR ranging from 26 to 121 deaths per 1,000 live births (Bhatia *et al.*, 1984). In South India, hospital studies indicate rates of 99 per 1,000 in Puna (Bhavsar and Shotri, 1989) and 90 per 1,000 in Madras (Santhanakrishnan *et al.*, 1986). A rural based study in Maharashtra (Shah *et al.*, 1990) reports a much lower rate of 43 deaths per 1,000 live births.

The wide variation in PNMR is mainly due to methodological problems. Relatively more problematic deliveries take place in hospitals and as a consequence estimations of the PNMR might be biased upwards. At the same time, in rural areas perinatal deaths might be under-estimated.

The causes of neonatal and perinatal mortality in developing countries are not easy to discern. Different studies indicate a wide variation in proportions of deaths attributed to various causes (WHO, 1991b, p. 8). Factors most commonly mentioned are prematurity and low birth weight, birth injuries, asphyxia, toxaemia, congenital malformations, or infections like tetanus, pneumonia, and septicaemia (Bhave, 1989; Shah *et al.*, 1990; Singh *et al.*, 1991; Holla, 1985; Bhave, 1989; UNICEF, 1991). All studies identified birth weight as a major indicator for infant survival. In the next subsection, therefore, we examine the etiology of birth weight.

2.1.4. Facts: birth weight

In the model of Van Norren and Van Vianen, 'constitution at birth' was identified as one of risk factors related to survival chances of children. One of the most important indicators of 'constitution at birth' is birth weight.

In India, the average birth weight is 2,700 grammes (UNICEF, 1991), one of the lowest figures all over the world (Kramer, 1987). Also the proportion of Low Birth Weight children (LBW, defined by the WHO (1991b) as birth weight $< 2{,}500$ grammes) is one of the highest known: 30 per cent of all live births (Kramer, 1987; Singh *et al.*, 1982; World Bank, 1993).

Birth weight is governed by two major processes: duration of gestation and intrauterine growth rate. Low birth weight is thus caused either by a short gestational period, intrauterine growth retardation, or by a combination of the two (Kramer, 1987, p. 664). Preterms are children born before 37 weeks of pregnancy (WHO, 1991b). Definitions of intrauterine growth retardation (IUGR) vary greatly between studies. To make it even more confusing, some studies equate terms like small-for-gestational-age (SGA) and small-for-dates to IUGR (like Kramer, 1987). The WHO (1991b), however, uses separate definitions. An IUGR child has completed 37 weeks of gestation and is below the 10^{th} percentile of a sex-specific birth weight for gestational age distribution from a well-nourished population. The concept of small-for-gestational-age (SGA) is used for a child whose birth weight is below the 10^{th} percentile for a given gestational age. This category thus also includes preterm children. A further classification is made into children who are proportionately SGA or affected by IUGR and children who are disproportionately SGA or affected by IUGR. The first group corresponds to a birth weight characterized by 'stunting' (weight and length of the child are in proportion), the latter by 'wasting' (length is normal but birth weight is low). The etiology of these two differ, as do their survival chances. 'Wasted' SGA or IUGR children result 'from pregnancies in which there is a short-term uteroplacental vascular insufficiency' and experience higher

neonatal morbidity than 'stunted' SGA or IUGR children, but have a higher potential for further development. 'Stunted' SGA or IUGR children result from a long-term uteroplacental vascular insufficiency which, among others, is related to 'pregnancies in mothers who are chronically malnourished, subject to multiple infections and having low energy reserves', and have a good survival chance in the beginning of life but are more likely to die later in infancy as a consequence of the damage experienced in utero (WHO, 1991b, p. 12). Survival chances, growth, and development of children are described in detail in Section 2.5. Here, we only deal with the etiology of low birth weight and prematurity.

In developed countries, low birth weight is predominantly due to preterm deliveries. It is assumed that in developing countries the IUGR is one of the main reasons for low birth weight (WHO, 1991b). However, the factor gestational age is often difficult to measure in developing countries.

In a major review of 921 studies, Kramer (1987) identified factors which have a direct causal impact on prematurity and IUGR, in developed as well as developing countries. The relative significance of these factors is depicted in the Figures 2.3 and 2.4. While examining the figures we should realize that Kramer (1987) equates SGA children to IUGR children.

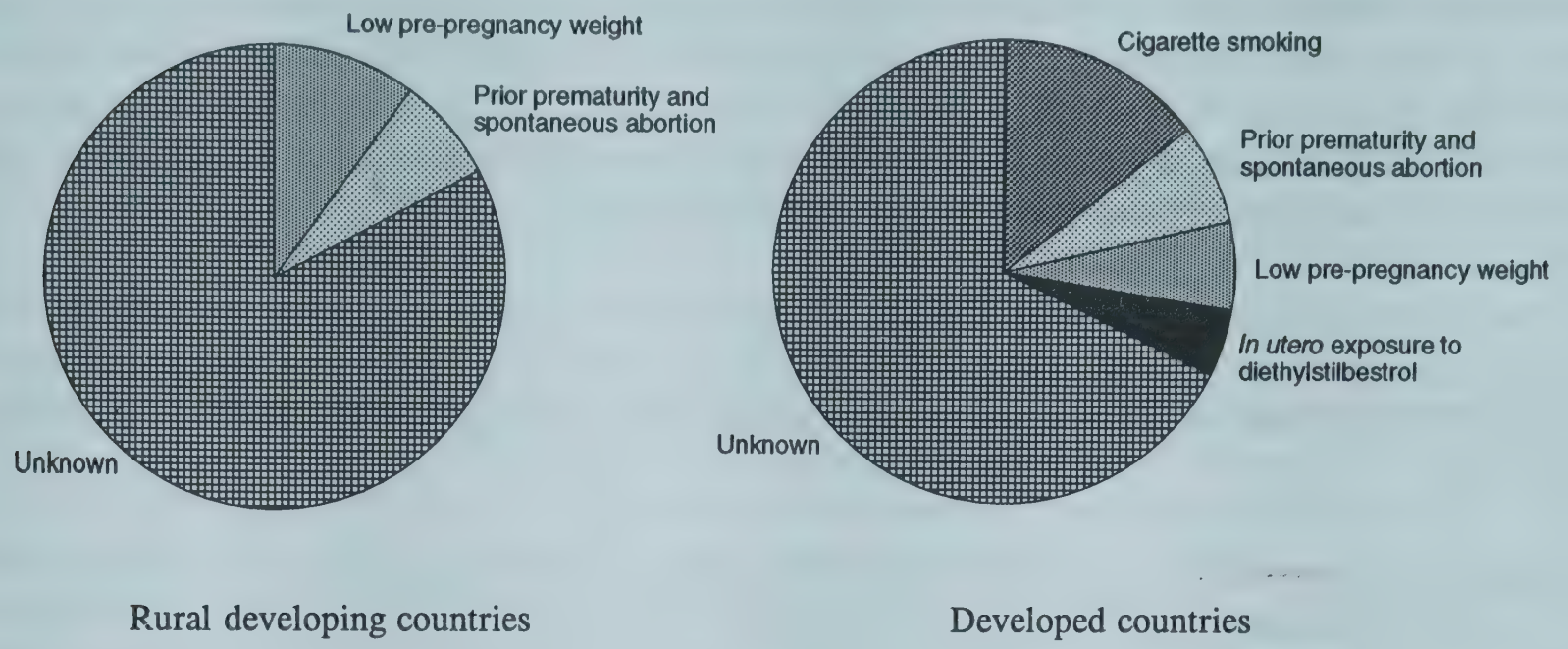
As figure 2.3 shows, causes of prematurity are mainly unknown. In developed countries, cigarette smoking is one of the factors identified, as are low prepregnancy weight, a history of premature births and spontaneous abortions, and in-utero exposure to diethylstilbestrol (DES). In developing countries, the only factors identified are low prepregnancy weight and a history of premature births and spontaneous abortions.

With regard to IUGR (see Figure 2.4), in both developed and developing countries the following related factors have been identified (although the magnitude of their impact varies): low caloric intake or weight gain during pregnancy, low prepregnancy weight, short stature, primiparity, female sex, maternal LBW and prior LBW history, and general morbidity. Non-white race was identified by Kramer (1987), in both developed and developing countries. In many medically oriented studies, the concept of non-white race is used to denote a genetic difference between ethnic groups. Women in this group are reported to have babies with a lower birth weight. However, it remains unclear whether these differences are genetically determined or due to differences in socio-economic status. In that case, the factor white race might just as well be included with the factors short stature or low prepregnancy weight. Here, we prefer not to use the concept of non-white race.

In the developed world, cigarette smoking has the largest effect on the IUGR while in the developing countries malaria plays a role.

In the next sections, we examine the relationship between these factors and the birth weight of children. We start with the variables low caloric intake and weight gain during pregnancy, the main topic of our research.

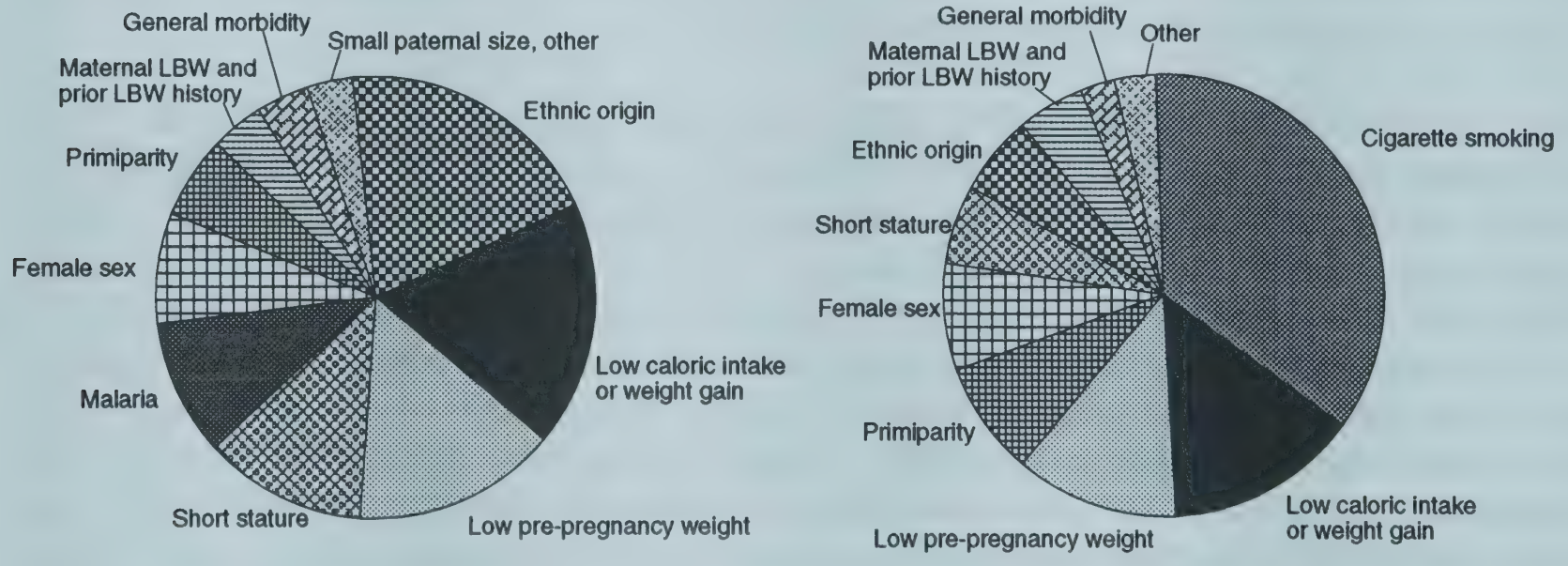
Figure 2.3. Relative importance of established factors with direct causal impacts on prematurity, rural developing and developed countries



Rural developing countries | Developed countries

Source: Kramer, 1971, pp. 721 and 723.

Figure 2.4. Relative importance of established factors with direct causal impacts on IUGR, rural developing and developed countries



Rural developing countries | Developed countries

Source: Kramer, 1987, p. 720.

2.2. Nutrition during pregnancy, maternal weight gain and birth weight

One of the variables identified in the last section as a factor contributing to low birth weight was nutrition during pregnancy. Here, we come to the main topic of this research. An important review on nutrition during pregnancy, maternal weight gain, and birth weight has been published by the National Academy of Sciences (NAS, 1990).

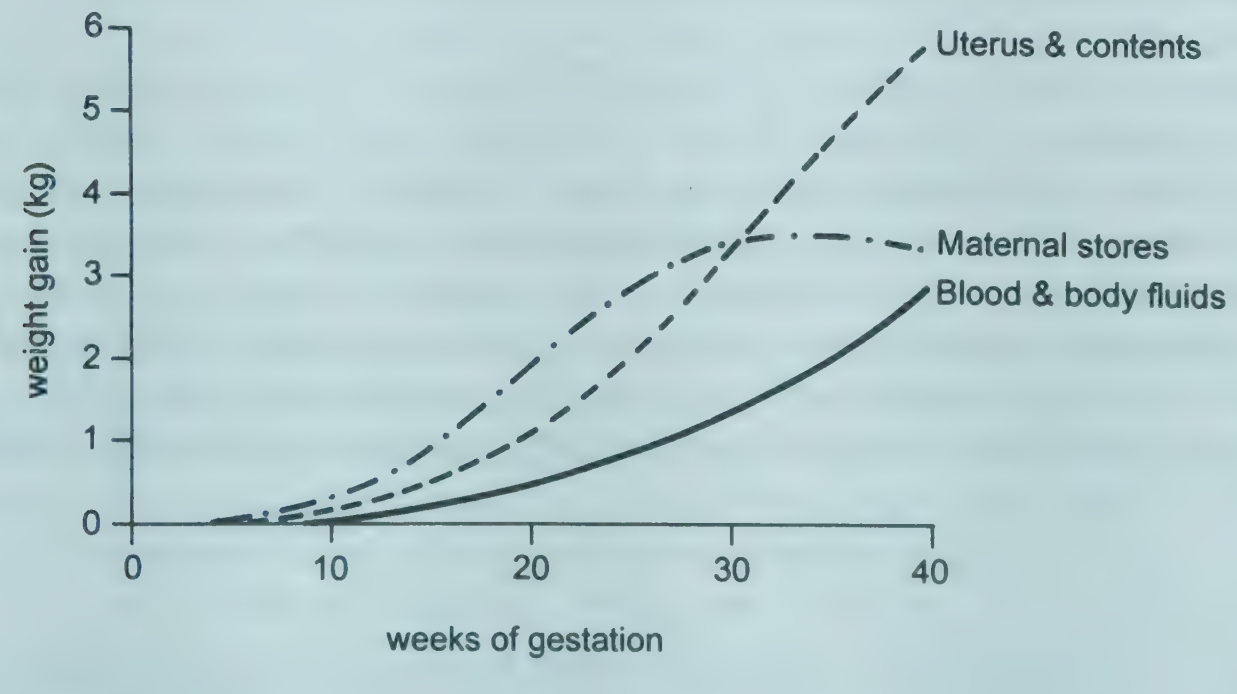
2.2.1. The course of pregnancy and nutritional recommendations

During pregnancy the body needs more energy for the growth and maintenance of the fetus, the placenta, and maternal tissue. Theoretically, as estimated by Hytten and Leitch (1971), in a 'normal' pregnancy in industrialized countries, total maternal weight gain amounts to 12.5 kg. A quarter of this, 3.4 kg., consists of weight of the fetus. Another five per cent is accounted for by the placenta (550 grammes), six per cent by amniotic fluid (800 grammes), 13 per cent by extracelluar fluid (1,600 grammes) and another 20 per cent by the expansion of maternal tissue (uterus, mammary glands, and blood volume: 2,620 grammes). In such a 'normal' pregnancy, 3.5 kg. is stored as maternal fat reserve.

Based on these figures, a theoretical total energy cost of pregnancy of 85,000 kcal. (i.e. 300 kcal. per day) has been estimated. Energy requirements are highest for deposition of maternal fat (more than 36,000 kcal.), stored between the 10th and the 30th week of pregnancy. Another important part of energy cost (almost 36,000 kcal.) consists of an increase in the rate of basal metabolism (BMR). Fetal demands are highest in the last quarter of pregnancy. The components of weight gain throughout pregnancy are illustrated in Figure 2.5 (based on Hytten, 1980b). As can be seen, storage of maternal fat reserves occurs between the 10th and the 30th week and serves as an energy store to be used during the last stage of pregnancy when the fetus shows its highest growth rate (Hytten, 1980b and 1980c; Van den Berg and Bruinse, 1983; NAS, 1990).

Based on these estimated total costs of pregnancy of 85,000 kcal., recommendations for an extra energy intake of 285-300 kcal. per day during pregnancy have been formulated (FAO/WHO, 1985). Recommendations with regard to nutrition during pregnancy and maternal weight gain have fluctuated through the centuries. Between the sixteenth and eighteenth century, in the now industrialized countries much emphasis was put on maternal food intake which was believed to be the most important source of nutrients for the fetus (NAS, 1990).

Figure 2.5. The components of weight gain in normal pregnancy



Source: Hytten, 1980b, p. 30.

In the nineteenth century, women tended to reduce their food intake in the belief that too much food would result in big babies and as a consequence pose problems at the time of delivery (Hytten, 1980b). During the last decades, food recommendations for pregnant women have varied. In 1953, a daily energy intake of 2,700 kcal. was recommended while in the sixties and seventies 2,200 and 2,400 kcal. per day respectively were advocated. The most recent standards recommend an extra intake of some 285-300 kcal. per day (FAO/WHO, 1985), resulting in an average total intake of about 2,500 kcal. per day. The Indian Council of Medical Research recommends an extra 300 kcal. per day during the second and third trimester of pregnancy[1] (ICMR, 1990, p. 33).

Recommendations regarding maternal weight gain have also varied over the last decades. The figures have almost doubled during the past fifty years (NAS, 1990, p. 40). In the 1920s and 1930s, American women were advised to restrict weight gain during pregnancy to 6.8 kg. In the 1940s and 1950s, it was standard practice to restrict weight gain during pregnancy to less than nine kg. In this way, the risk of toxaemia and birth complications, associated with larger babies, was believed to be reduced. Two decades later, based on a review of all the studies available at the time, Hytten and Leitch (1971) concluded that an average weight gain of 12.5 kg. would be 'normal' in healthy, young, primiparae. In the mid-seventies, it was recognized that besides total weight gain, the pattern of weight gain was also important: a smooth, linear gain was advocated (NAS, 1990).

Given these recommendations, in the next section we review several studies, conducted in both developed and developing countries, and see whether actual daily energy intake of women during pregnancy meets the recommended levels. In addition, we evaluate the actual levels of women's weight gain and birth weight of children.

2.2.2. Actual energy intake during pregnancy, maternal weight gain, and birth weight

Longitudinal studies on nutrition during pregnancy conducted in the industrialized countries indicate a

> "slight, although not always statistically significant and not universal, increase in energy intake during pregnancy" (NAS, 1990, p. 138).

In the Netherlands, Van Raay *et al.* (1986 and 1987) find no change in energy intake during the first two trimesters of pregnancy. In the first months, daily energy intake resembles the prepregnancy intake of 2,160 kcal. per day. Only in the third trimester is there a small but insignificant increase. The cumulative increase over this last trimester has been estimated to be 22 MJ (= 5,200 kcal.; 1 MJ = 239 kcal.), i.e. about 57 kcal. per day. Average maternal weight gain of Dutch pregnant women amounts to 11.6 kg., while mean birth weight has been estimated to be 3,458 grammes. In the same country, a study by Spaay (1993) reports an increase over the period before pregnancy to week 35 in pregnancy of 45 MJ (= 10,755 kcal.)

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[1] Recommended daily energy intake for Indian women with body weight of 50 kg are (ICRM, 1990, p. 129):
- Sedentary work 1,875 kcalories
- Moderate work 2,225 kcalories
- Heavy work 2,925 kcalories

only: 44 kcal. per day. The weight gain of women and birth weight resemble those in the former studies: 11.7 kg. and 3,571 grammes respectively.

Durnin *et al.* (1986a and 1987) in Scotland too find an increase, although not significant, in energy intake during pregnancy. A gradual increment takes place from 18 weeks of pregnancy onwards, reaching a level of 150 kcal. extra per day at the end of pregnancy. The average increase in energy intake, i.e. over the whole period of pregnancy is estimated to be 75 kcal. per day. Total weight gain and average birth weight in this study amounts to 11.7 kg. and 3,370 grammes respectively. In a study by Truswell *et al.* (1988) in Australia, energy intake during pregnancy does not increase at all during pregnancy. Still, maternal weight gain amounts to 12.4 kg. and mean birth weight to 3,540 grammes.

These four studies in industrialized countries indicate that women do not always increase energy intake during pregnancy and that if they do, the increase is small. The increase is nowhere near the international recommendations of 285-300 kcal. per day extra throughout pregnancy. But, with a small increase in energy intake or even a normal energy intake, on average women are still able to gain about 11-12 kg. during pregnancy and to give birth to children weighing around 3,500 grammes. We return to this in Subsection 2.3.1.

In developing countries, few longitudinal studies have been conducted. The study by Thongprasert *et al.* (1986 and 1987) among 44 poor rural women in Thailand indicates an overall increase in energy intake. At week 10 of pregnancy, the average daily energy intake amounts to 1,932 kcal. per day. Up to term, the overall increase in energy intake has been estimated to be 238 MJ (= 56,900 kcal.), reaching a level of average intake of 2,136 kcal. per day. These data suggest an increase in daily energy intake during the last 30 weeks of 271 kcal.(!). Average weight gain of Thai women amounts to 8.9 kg. and mean birth weight is estimated to be 2,980 grammes.

In their study among 66 low and middle income women in Mexico, Hunt *et al.* (1987) find a decline in energy intake during the last part of pregnancy. In the 18th week of pregnancy, an average 1,831 kcal. per day is consumed, in the 35th week 1,750 kcal. only. In this period women gain on average 6.8 kg. Mean birth weight amounts to 3,381 grammes, the proportion of LBW children is zero.

Tuazon *et al.* (1986 and 1987) studied 51 rural women in the Philippines and also found a slight decline, although insignificant, in energy intake over the second and third trimester of pregnancy. However, energy intake at a mean gestational age of 19 weeks is significantly higher than the energy intake at a mean gestational age of 31 weeks. The cumulative decline during the last two trimesters amounts to only 8.4 MJ (= about 2,000 kcal.). Women gain an average 8.4 kg. and mean birth weight was 2,885 grammes. Summarizing these studies in developing countries, only the study in Thailand indicates an increase of energy intake approaching recommended levels. However, the data of this study on energy intake seem to be open to question (Nestlé Foundation, 1990). In the other studies, energy intake declines slightly at the end of pregnancy. Differences in maternal weight gain and mean birth weight, between industrialized and developing countries are obvious, but within the latter countries not much difference exists. In Mexico, where women eat slightly less at the end of pregnancy,

mean birth weight is even higher than in Thailand where energy intake increases considerably. It seems that other confounding factors play an important role.

In India, only few longitudinal studies on actual food intake during pregnancy are available. Studies have concentrated more on food supplementation during pregnancy. Rawtani and Verma (1989) studying 40 rural women in Rajasthan find no significant increase in energy intake during the whole pregnancy. Average intake in all trimesters fluctuates around 2,200 kcal. In this study weight gain and birth weight was not estimated. The study by Devadas and Easwaran (1986) in rural Madurai, indicates that women do not change energy intake during pregnancy: the authors find no difference in food intake between pregnant and non-pregnant women.

However, to get an idea of the actual levels of energy intake during pregnancy, weight gain, and birth weight in India, we can make use of many cross-sectional studies. Energy intake differs widely between socio-economic groups (Grover, 1982; Bhatia *et al.*, 1983). The upper income class in India shows a pattern similar to women in industrialized countries: average daily energy intakes range between 2,000 and 2,500 kcal. per day, mean maternal weight gain and birth weight amounting to 11 kg. and 3,200 grammes respectively (Prema, 1978; Agarwal *et al.*, 1987; Prema, 1989). The lower urban income groups have average energy intakes of between 1,200-1,600 kcal. per day, average maternal weight gains of six kg., and mean birth weights of 2,700 grammes. Among the lower income groups in rural areas, a similar pattern of maternal energy intake and birth weight prevails, but women gain on average only five kg. in weight (Kaur *et al.*, 1982; Bhatnagar *et al.*, 1983; Kataki *et al.*, 1989; Prema, 1989; Badole *et al.*, 1992).

The studies reviewed above, indicate the levels of energy intake during pregnancy, maternal weight gain, and birth weight in both industrialized and developing countries. The effects of energy intake during pregnancy on maternal weight gain and birth weight can be illustrated by studies using an experimental design like those in which women who receive food supplementation during pregnancy are compared with a control group of women who do not receive supplementation. Many such studies have been conducted; they are reviewed in the next subsection.

2.2.3. Food supplementation, weight gain, and birth weight

Many studies, conducted in both developing and developed countries, focus on the effects of food supplementation during pregnancy on maternal weight gain and pregnancy outcome. Studies have been conducted, among others, in San Francisco (Adams *et al.*, 1978), Birmingham (Viegas *et al.*, 1982), Guatemala (Lechtig *et al.*, 1975a; 1975b), Indonesia (Kardjati, 1985; Kardjati *et al.*, 1988), India (Iyengar, 1967; Bhatnagar *et al.*, 1983), Colombia (Herrera *et al.*, 1980), Taiwan (Adair *et al.*, 1984; McDonald *et al.*, 1981), the Gambia (Prentice *et al.*, 1987), and Chile (Mardones-Santander *et al.*, 1988). Some of these are reviewed here. The studies differ in the kind and duration of supplementation provided, in socio-economic background of the research group, and also in the reported effects of supplementation on weight gain and birth weight.

The first two studies found a positive effect of supplementation on weight gain and birth weight. In the Guatemalan study (Lechtig *et al.*, 1975a), women receiving more than 20,000 kcal. of supplementation during pregnancy, gain on average 1.8 kg. more (reaching an average of 8.8 kg.) than normal. Average birth weight increases by 30 grammes per 10,000 kcal. of supplementation. In Indonesia (Kardjati, 1985; Kardjati *et al.*, 1988), average weight gain of women receiving 465 kcal. supplementation per day during the third trimester of pregnancy, amounts to 7.1 kg. Women who did not receive food supplementation gain on average 6.3 kg. Average birth weight increases by 50 grammes per 10,000 kcal. supplementation.

In other studies, no overall positive effect was found. In the study in rural Taiwan (Mc Donald *et al.*, 1981; Adair *et al.*, 1984), supplementation took place over a long period. It started three weeks after delivery of the first (study) child and continued throughout lactation, pregnancy and lactation of the second child. The study shows no significant differences in weight gain, birth weight, proportion of low birth weight children, and fetal deaths between women receiving either a high or low supplementation. The only positive effect found consists of the fact that, among women who received more supplementation, the birth weight of second male children is significantly higher than among first children. In the Colombian study (Herrera *et al.*, 1980), supplementation indeed causes a significant increase in birth weight (95 grammes more), but among males only. In the study in the Gambia (Prentice *et al.*, 1987) food supplementation turns out to be very effective only with regard to birth weight (not weight gain), and only during the wet season, a period of food shortages and high agricultural activity. Among supplemented women, the proportion of low birth weight children declines from 23.7 to 7.5 per cent.

In India, several studies on the effects of food supplementation have been conducted. The study by Bhatnagar *et al.* (1983), conducted in the slums of Delhi, shows a positive effect on weight gain and birth weight. Women receiving supplementation —supplied within the Integrated Child Development Service (ICDS; see Chapter 4) and consisting of 300 kcal. plus 16 grammes protein given from week 24 of pregnancy— gained on average 4.28 kg. Those who did not receive supplementation, having an average energy intake of 1,200 kcal. per day, gained on average only 3.57 kg. The percentage of LBW children in the first group amounted to 21.7 opposed to 34.7 in the latter. A less recent study by Iyengar (1967) was conducted in Hyderabad, where women received supplementation during hospitalization in the third trimester of pregnancy. Hospitalized women gained on average 1.25 kg. in the last month of pregnancy. The author compares this with other studies in which non-hospitalized women gained on average only 0.35 kg. in this period. The higher weight gain in the first group might be due to supplementation, but the extra bed rest may also have helped. Birth weights of children differ between the two groups: 3,028 and 2,704 grammes respectively. Other studies in India such as the one by Dawn and Mitra (1990) on the effects of supplementation on weight at birth and weight at six weeks postpartum among low-middle class women found a significant increase in weight gain but no significant decline in the proportion of low birth weight children. The weight of children six weeks postpartum was significantly higher among women who received supplementation.

Reviewing all these studies, it can be concluded that the results of studies on the effects of food supplementation during pregnancy are not unanimous. In some studies, no effect or even

a negative effect of supplementation during pregnancy was found. In San Francisco, Adams *et al.* (1978) found no effect of supplementation on either weight gain or birth weight. Viegas *et al.* (1982) in Birmingham even found a decrease in birth weight among the study population (Asian women). In other studies, however, a positive relationship was found between food supplementation, weight gain, and birth weight. Others found only partial positive effects. In the study in Taiwan (Adair *et al.*, 1984; McDonald *et al.*, 1981) and the Gambia (Prentice *et al.*, 1987), birth weight was affected by energy intake, but no accompanying change in maternal weight gain took place.

The direct relationship between energy intake, weight gain, and birth weight is therefore not clear and it remains uncertain whether "the effects of energy intake on birth weight are a result of changes in maternal weight gain" (NAS, 1990, p. 163).

In the studies which observe a positive effect of food supplementation on birth weight, other factors seem to be partly responsible. In Colombia, Herrera *et al.* (1980) find increases in birth weight of male children, among women who experience a low weight for height status. In the Gambian study (Prentice *et al.*, 1987) positive effects of supplementation are found, but only in the wet season. Iyengar (1967) finds positive effects among women who are hospitalized: not only did they receive supplementation but also got more rest and received better antenatal care. It is therefore not clear whether any changes in weight gain and birth weight are really due to the supplementation programme or to these other factors such as prepregnancy weight for height status, extra antenatal care, seasonal variation, extra rest, or a reduction in physical activities. In the next section, we focus on these other, intervening, factors.

2.3. Intervening variables

In the relationship between energy intake, maternal weight gain, and birth weight of children, confounding factors and effect modifiers play a role. Confounding factors are those factors which distort the apparent relationship between an exposure (X) and outcome (Y) under study, i.e. they make the relationship appear stronger or weaker than it really is. A confounding factor should meet the following criteria: it should itself be a determinant of the outcome (Y), it should be associated with the exposure (X) and not lie on the causal path between exposure (X) and outcome (Y) (NAS, 1990, p. 30). The most important confounding factors in the relationship between energy intake and weight gain of mothers are physical activity and body size. An effect modifier is a factor that modifies (i.e. increases and decreases) the magnitude of the effect of a determinant on a particular consequence. Unlike confounding factors, an effect modifier may not be associated with either the exposure (X) nor outcome (Y). Pre-pregnancy weight-for-height status, age, and ethnic origin have been identified as effect modifiers in the relationship between weight gain and birth weight (NAS, 1990, pp. 30-31).

Let us first take a closer look at a confounding factor in the relationship between energy intake and maternal weight gain: physical activity.

2.3.1. Intervening variables: energy expenditure and physical activity

One of the most important confounding factors in the relationship between energy intake and maternal weight gain is physical activity. Weight gain during pregnancy is a direct consequence of the energy balance, i.e. the difference between energy intake and energy expenditure. Thus, changes in maternal weight gain during pregnancy might be due to either a change in energy intake or in energy expenditure or both. The basic components of energy expenditure are basal metabolism, thermogenesis, and physical activity (NAS, 1990, p. 165). Thermogenesis is an increase in energy expenditure above basal metabolism following the ingestion of food (NAS, 1990, p. 165). Basal metabolism and physical activity during pregnancy are discussed below.

Total energy cost of pregnancy and basal metabolism. The theoretical cumulative energy cost of pregnancy has been estimated to be 85,000 kcal. (see also Subsection 2.2.1). This estimate makes no allowance for the increased energy cost of moving a heavier body mass. It is assumed that this expenditure will be compensated by a reduction in physical activity (NAS, 1990, pp. 137-138).

The theoretical net increase of energy cost during pregnancy totals about 77,500 kcal. (the difference with the earlier mentioned 85,000 kcal. is that the latter amount is needed if the extra energy costs of pregnancy have to be met by energy intake only; Van Raay *et al.*, 1985, p. 33) of which 36,000 kcal. are due to an increase in basal metabolic rate (BMR).

A group of researchers have conducted studies, in both industrialized and developing countries, in which the actual extra energy costs of pregnancy and increases of BMR or resting metabolism rate (RMR) during pregnancy have been calculated. The magnitude of total costs and increase in BMR reported in the different studies varies widely (see Table 2.1). The studies conducted in the Netherlands (Van Raay *et al.*, 1986 and 1987, and Spaay, 1993), and Scotland (Durnin *et al.*, 1986 and 1987) show the following. In the first study, a net total energy cost of pregnancy of 286 MJ (= 68,354 kcal.; 1MJ = 239 kcal.) was found, which is only 11 per cent lower than the theoretical estimate. The cumulative increase in BMR throughout pregnancy is slightly lower than the theoretical estimate, i.e. 34,700 kcal. The second study found a higher total cost of pregnancy of 335 MJ (= 80,065 kcal.) of which 189 MJ (= 45,171 kcal.) consists of a cumulative increase of RMR. Among Scottish women a total pregnancy cost of 281 MJ (= 67,159 kcal.) and an increase of 126 MJ (= 30,100 kcal.) in BMR was found.

In the developing countries, the estimated total energy costs of pregnancy and cumulative increases in BMR appear to be much lower. In rural Thailand (Thongprasert *et al.*, 1986 and 1987), the total energy cost of pregnancy was estimated to be 208 MJ (49,712 kcal.) and the cumulative increase in BMR only 100 MJ (= 23,900 kcal.). In the Philippines, Tuazon *et al.* (1986 and 1987) found an overall cost of pregnancy, estimated over the second and third trimester, of 181 MJ (43,259 kcal.) and a BMR of 79 MJ (= 18,881 kcal.). The study conducted in the Gambia (Lawrence *et al.*, 1986) is a special case. Women who did not receive supplementation and had to live on a low energy diet, showed a negative cost of pregnancy (-11,700 kcal.) which was mainly achieved by a net overall saving in BMR of 10,700 kcal.

Table 2.1. Estimated total energy cost of pregnancy, increase in BMR, energy intake, fat storage, maternal weight gain, and birth weight in different studies

	Theoretical (a)	Netherlands (b)	Netherlands (c)	Scotland (d)	Thailand (e)	Philippines (f)	Gambia (g)	
							no supplementation	supplementation
Total energy cost of pregnancy	77,500 kcal.	68,354 kcal.	80,065 kcal.	67,159 kcal.	49,712 kcal.	43,259 kcal.	-11,700 kcal.	27,400 kcal.
Increase BMR	36,300 kcal.	34,700 kcal.	45,171 kcal.	30,100 kcal.	23,900 kcal.	18,881 kcal.	-10,700 kcal.	1,000 kcal.
Extra energy intake	300 kcal. per day	5,200 kcal. (57 kcal./day)	10,755 kcal. (44 kcal./day)	21,000 kcal. (75 kcal./day)	271 kcal. per day	-2,000 kcal.	reduction	
Period of measurement, energy intake	whole pregnancy	last trimester	prepregnant to 35 weeks	10-40 weeks	10-40 weeks	last two trimesters	wet season	
Maternal weight gain	12.5 kg.	11.6 kg.	11.7 kg.	11.7 kg.	8.9 kg.	8.4 kg.	7.4 kg.	9.2 kg.
Birth weight	3,500 gr.	3,458 gr.	3,571 gr.	3,370 gr.	2,980 gr.	2,885 gr.	2,962 gr.	2,986 gr.
Maternal fat storage	3.5 kg.	2.0 kg.	2.1 kg.	2.3 kg.	1.4 kg.	1.3 kg.	-0.6 kg.	1.7 kg.
N		57	27	88	44	51	23	29

Sources:

a. Hytten (1980c)
b. Van Raay *et al.* (1986 and 1987)
c. Spaay (1993)
d. Durnin (1986 and 1987)
e. Thongprasert *et al.* (1986 and 1987)
f. Tuazon *et al.* (1986 and 1987)
g. Lawrence *et al.* (1986 and 1987), Lawrence and Whitehead (1987)

Also Durnin (1987).

In other words, women show a positive energy balance over the whole pregnancy period, suggesting

> "a remarkable physical adaptation, presumably not to pregnancy alone but to pregnancy in the face of some severe nutritional stress" (Durnin, 1987, p. 1132).

The increase in BMR in the two studies in the Philippines and Thailand does not reach the levels of the theoretical estimates. This might be partly due to the period in which measurement of BMR took place, early pregnancy. It is likely that the real costs are higher (Durnin, 1987). As the NAS (1990) concludes, the lower levels of overall cost of pregnancy are partly due to smaller body size but might also be a result of adaptations in metabolism. While standardizing body weight (which is lower in developing countries), there appears to be a high degree of uniformity in the overall extra costs of pregnancy (Durnin, 1987).

Energy expenditure and energy intake: the balance. Let us now compare this energy expenditure during pregnancy with actual energy intake (see also Subsection 2.2.2). The recommended extra energy intake of 285-300 kcal. per day during pregnancy is based on the theoretically estimated extra energy costs of pregnancy of 85,000. However, comparing the actual figures on energy intake (see also Table 2.1) and energy expenditure, in three of the five studies, i.e. not those conducted in Thailand and the Gambia, there seems to be a negative energy balance. Energy expenditure appears to be much higher than energy intake during pregnancy. In the Netherlands and Scotland energy intake during pregnancy increases only slightly, leaving a large gap between energy expenditure and energy intake. But, women are still able to gain about 11-12 kg. during pregnancy and to give birth to children weighing between 3,400-3,600 grammes. Van Raay *et al.* (1987, p. 953) conclude that

> "the main mechanism by which the pregnant body is able to save energy and bridge the energy gap are adjustments in physical activity, an increase in work efficiency and an adaptation of the metabolic response to food."

In an earlier article (1986) the authors conclude that

> "a reduction in diet induced thermogenesis might be the largest contributor to extra energy saving" (Durnin *et al.*, 1986, p. 74).

The same author concludes, based on these two studies, that

> "in industrialized countries extra energy requirements during pregnancy might be much lower than thought before. Instead of the recommended 300 kcal. per day extra, an addition of 100 kcal. per day would be more than adequate".

For developing countries, it is more difficult to formulate general conclusions. In Thailand (Thongprasert *et al.*, 1987), the low total cost of pregnancy (49,712 kcal.) is compensated by an increase in energy intake which amounts to 238 MJ (56,882 kcal.). Even if the actual total cost is higher (Durnin, 1987), the energy balance would still be positive. In the study in the Philippines, a small decline in energy intake over the last two trimesters was found, leaving a huge gap between expenditure and intake. Although changes in physical activity provided part of the estimated energy needs, there is still a deficit of at least 700 KJ (167 kcal.) per day. Surprisingly, although energy intake is much lower than in the study in Thailand, the average weight gain of women (8.4 kg.) and birth weight (2,885 grammes) do not differ much between the two studies. Data in the study in the Gambia are even more

confusing. At low energy intake, a positive energy balance during pregnancy was achieved by saving energy expenditure. Expenditure could be reduced by changes in basal metabolism, a reduction in physical activity and mobilisation of maternal fat reserves. However, some question marks can be put at the measurement of energy intake in this study (Lawrence *et al.*, 1987; Lawrence and Whitehead, 1988).

With regard to storage of maternal fat reserves during pregnancy, Table 2.1 clearly shows the differences between the industrialized and developing countries. The theoretical estimated 3.5 kg. is not met in either study, nor in the Netherlands or Scotland with averages of 2.0 and 2.3 kg. respectively. In the Philippines and Thailand, storage of maternal fat amounts to only 1.3 and 1.4 kg. respectively.

Physical activity. As mentioned above, the gap between energy intake and energy expenditure might be bridged by an adaptation of the metabolic response to food, or by adjustments in physical activity, or increase in work efficiency.

Spaay (1993) investigated the contribution of these three mechanisms among Dutch women. She found no metabolic adaptations nor changes in work efficiency during pregnancy, but did observe that physical activity declined significantly during pregnancy. She concludes that energy savings by reduction of physical activity might be much higher (125-250 MJ) than commonly assumed (100 MJ). A small increase in energy intake (45 MJ) and this behavioral adaptation together would almost meet the total energy costs of pregnancy.

Other studies, however, indicate no change in physical activity. In industrialized countries, where in general women live a more sedentary life (compared with women in developing countries), no or only a slight change in physical activities during pregnancy was reported by Blackburn and Calloway (1976), Durnin *et al.* (1986), and Van Raay *et al.* (1986). The last two studies found that women only spent relatively more time sitting while they reduced walking.

In developing countries, in general women are more active throughout pregnancy (NAS, 1990). Several studies indicate a change in intensity and duration of physical activities during pregnancy. In New Guinea (Durnin, 1980) pregnant women change the intensity and duration of their activities, especially during the last trimester. They walk less, spend more time sitting, and work for shorter periods in the gardens. In Thailand (Thongprasert *et al.*, 1986) and the Philippines (Tuazon *et al.*, 1986), women increase time sitting and reduce heavy agricultural and household work. In Ethiopia, Tafari (1980) finds that women who work more and harder during pregnancy, while consuming the same amount of food as women who work less, experience a lower weight gain and give birth to children with lower birth weights.

Physical activity could also have another, independent effect on pregnancy and pregnancy outcome. Physical exertion or an upright posture might diminish uterine blood flow, hindering the supply of oxygen and nutrients to the fetus (Briend, 1979 and 1984). Furthermore, postprandial physical exertion (i.e. physical activity after having meals) might lead to reduced absorption of nutrients by shifting blood away from the gastro-intestinal tract. Psychological

stress associated with maternal employment is another mechanism which could possibly influence intrauterine growth (Kramer, 1987).

2.3.2. Intervening variables: height and prepregnancy weight-for-height status

Another confounding factor in the relationship between energy intake and weight gain of the mother is body size. Height and prepregnancy weight of the mother confounds the relationship between energy intake and weight gain: women who are taller are usually also heavier and will consume more calories. In the relationship between weight gain and birth weight, prepregnancy weight-for-height status is an important effect modifier. This means that very low prepregnancy weights in combination with low maternal weight gain over pregnancy result in very small babies. High prepregnancy weights in combination with high maternal weight gain over pregnancy result in bigger babies (Garn, 1991, p. 78).

In our research project, prepregnancy weight-for-height status is an important variable as we want to know what the effects are of a reduction in food intake during the last trimester of pregnancy among women whose nutritional status is already poor before conception (see Chapter 1).

First, let us review the literature on the effects of height and prepregnancy weight-for-height status. The only study which reports a significant independent effect of height on the weight gain of women during pregnancy, is the one conducted by Kleinman (1990): short women gain on average less weight than taller women (c.f. NAS, 1990, p. 112). Low maternal height also accounts for a sizeable proportion of IUGR infants (Kramer, 1987) (see Figure 2.4).

Several studies focus on prepregnancy weight and its effect on weight gain during pregnancy. The results differ. Abrams and Laros (1986) find that weight gain is less among underweight and very overweight women. Tripathi *et al.* (1987), in their study in rural Varanasi District, find that women who were wellnourished (prepregnancy weight $>$ 45 kg. and mid-upper-arm-circumference (MAC) $>$23 cm) gain on average 2 kg. more than under-nourished women whose weight and MAC are below these levels. Weight gain of undernourished women was mainly affected in the third trimester: women gain only 50 per cent of the total weight gain of well nourished women. However, Brown *et al.* (1981) found no difference in weight gain between underweight and normal weight women.

A better indicator than height and weight alone of nutritional status before pregnancy is the Body Mass Index (BMI). BMI (weight / height^2), is an indicator of chronic energy deficiency (CED) among adults (James *et al.*, 1988). The effects of BMI on maternal weight gain have been studied by several researchers (Brown *et al.*, 1981; Mitchell and Lerner, 1989; Haiek and Ledermann, 1989). The results of these studies differ widely. Mitchell and Lerner (1989) found a significantly lower weight gain among women with a very low and low prepregnancy weight-for-height status. In the study of Haiek and Lederman (1989) these groups of women also gained less weight than normal and overweight women (NAS, 1990). Kleinman (1990), however, found that maternal weight gain declines when prepregnancy BMI (classifications from BMI $<$ 19.8 to BMI $>$ 29.0) increases from moderate to very high (NAS, 1990). Given this variation in results, the NAS (1990, p. 111) concludes that "maternal prepregnancy weight for height status accounts for only a small part of the variation in weight gain".

However, more recent studies in developing countries indicate an inverse relationship between prepregnancy weight-for-height status and weight gain. In Madura, Kusin *et al.* (1992) and Kardjati *et al.* (1994) measured the net change in maternal weight by comparing post-partum (4-7 weeks) weight and BMI with the prepregnant figures. They find that irrespective of parity, at a minimum level of energy intake of 1,500 to 1,600 kcal., women with severe and moderate chronic energy deficiency (CED) (BMI $\leq$ 16.0 and 16.0 $<$ BMI $\geq$ 16.9) exhibit the highest net weight gain (2.4 kg.). Women who are not-CED (BMI $>$ 18.4) do not lose weight but neither do they built up fat reserves. Winkvist *et al.* (1992) find the same results among Pakistani women: the largest positive maternal weight gain takes place in the low initial weight group. We will return to these studies later on.

For the relationship between prepregnancy weight-for-height status and birth weight results of studies are more unanimous. In India, Bhatia *et al.* (1983) find that women with a higher weight-for-height ratio, even when their dietary intake during pregnancy is low, are more able to meet the demands of the growing fetus (probably by depleting their own tissues) than women whose prepregnancy ratio is lower and whose dietary intake remains the same. In addition, food supplementation proved to have the strongest effect among women with a low prepregnancy weight-for-height (Lechtig *et al.*, 1975a; Herrera *et al.*, 1980). In the latter study, women with low prepregnancy weight-for-height status achieve almost the same birth weight as higher classified groups.

In the relationship between maternal weight gain and birth weight of children, prepregnancy weight-for-height is an effect modifier. Studies such as those by Abrams and Laros (1986), Mitchell and Lerner (1989) and Naeye *et al.* (1973) indicate lower mean birth weights and a higher proportion of low birth weight children among women with low prepregnancy weight-for-height status experiencing low weight gain.

Studies which use BMI as indicator of prepregnancy nutritional status find a positive effect between BMI and birth weight. In India, Raman (1987) finds that for women who have a lower BMI before pregnancy, the proportion of LBW children is 60 per cent. For women with a higher BMI this proportion is only 19.2 per cent. She concludes that for any given parity and age, BMI could predict Intra Uterine Malnutrition in at least 60 per cent of the mothers (Raman, 1987, p. 506). Naidu *et al.* (1991) find the same positive relationship between BMI and birth weight.

Kusin *et al.* (1994) find an upward gradient in mean birth weight with increasing prepregnant BMI. The severe CED group (BMI $<$ 16.0) has a high incidence of LBW children (22 per cent). In comparison, women with BMI $\geq$ 17.0 have a LBW incidence of only five per cent. The same results are reported by Winkvist *et al.* (1992) in Pakistan. As mentioned before, the first study finds that weight gain of women is highest among CED women and the authors conclude that

> "in CED women, pregnancy .. promoted weight gain of the women to the detriment of fetal and infant growth" and "apparently there are limits to maternal depletion" (Kusin *et al.*, 1992, p. 15).

2.3.3. Intervening variables: others

Having discussed the major intervening variables, i.e. energy expenditure and physical activity, prepregnancy height and weight and weight-for-height status, other factors associated with either maternal weight gain, or birth weight, or both are discussed in this section.

Age and parity. Age of the mother is a factor which seems to affect weight gain of women especially in developing countries, where pregnancies among young women are more common. The NAS (1990) concludes that in most studies in developed countries no significant effect of age on maternal weight gain has been found. Only very young adolescents, becoming pregnant within two years after menarche, showed a lower weight gain during pregnancy. In Peru, Frisancho *et al.* (1983) report lower weight gain (0.8 kg. less) among very young girls (between 12-13 years old) while weight gain among older teenagers (> 13 years) does not differ from others.

Age is closely related to parity. Whether parity affects weight gain of mothers is not clear. The results of studies vary widely. Kleinman (1990) concludes that primiparae gain more in weight than multiparous women, although the differences are small (NAS, 1990). In India, Tripathi *et al.* (1987) find that primiparae and women aged under 20 gain less weight than others. Based on these few studies measuring the independent effects of age and parity on maternal weight gain, we might conclude that the effects are minor and are found only among very young mothers.

The relationship between age, parity, and pregnancy outcome is far more clear. Age itself does not seem to have an independent effect on birth weight (Kramer, 1987). The NAS (1990) concludes that once the differences in weight gain, prepregnancy weight, and other confounders are controlled for, no significant differences in fetal growth are found among adolescents. Among younger adolescents (< 16 years), however, results differ and are not unanimous.

In developing countries, pregnancies among young women are more common and many studies mention the effect of age and parity on pregnancy outcome. In Indonesia, Kardjati shows that younger women have lighter babies than older women (Kardjati, 1985). In India, Grover (1982) concludes that women younger than 20 and older than 30-35 years are more at risk of having LBW children. Here too the relationship with parity is made. Tripathi *et al.* (1987) find an effect of age and parity on birth weight: women younger than 20 and of first parity have children with a lower birth weight. Prema (1978) finds among teenage mothers and primiparae a mean birth weight of 2.55 kg. and 2.54 kg. respectively, which is significantly lower than older and higher parity mothers who experience an average birth weight of 2.7 kg.

Morbidity. Morbidity during pregnancy can affect maternal weight gain and pregnancy outcome through different mechanisms (Kramer, 1987). Firstly, morbidity can induce a reduction in food intake, which in the long run leads to lower weight gain and a decrease in energy available for the fetus. Secondly, the metabolic cost of maintaining febrile temperatures or of mounting appropriate host defences may again reduce energy available to the fetus, even

if dietary intake is constant. Furthermore, morbidity could lead to diminished uterine blood flow and interfere with fetal growth or precipitate premature birth (Kramer, 1987, p. 703).

Literature on effects of morbidity during pregnancy on weight gain of women and growth of the fetus is rare. Most research focuses on the relationship between rubella and fetal growth. Viral infections like measles and hepatitis have also been studied. However, mainly due to methodological problems, little is known about the effects of diseases which are more common in developing countries.

One of the few studies available is the one conducted by Lechtig *et al.* (1976) in Guatemala. They find a negative relationship between diseases such as diarrhoea, upper respiratory diseases, fevers, anorexia, and birth weight of the child. Mata (1978 and 1980) in his study in rural Guatemala found that only morbidity during the last trimester of pregnancy had a negative effect on birth weight.

No unanimous conclusion about the influence of malaria on weight gain and birth weight can be drawn (Kramer, 1987). Some studies, like the one by McGregor *et al.* (1983), find a decrease in birth weight among women with placental malaria. Some Indian studies focus on the effects of jaundice (Chauilan and Patel, 1991) and urinary tract infections (UTI) (Yashodhara *et al.*, 1987). The latter found a high incidence of UTI during pregnancy, but reported its role for pregnancy outcome to be controversial.

Anaemia. Kramer (1987) states that anaemia is not a true causal determinant of IUGR but a marker of maternal nutrition. As such, anaemia plays an important role in developing countries. The condition often antedates conception and the haemoglobin (Hb) level declines further during pregnancy. Anaemia is commonly defined, by for example UNICEF (1991), as a haemoglobin level below 11 gr/dl (see also Chapter 3, on methodology).

In India, anaemia is highly prevalent especially in the lower income groups. Studies indicate prevalence rates during pregnancy (Hb level below 11 gr/dl) varying from 40-50 per cent in urban areas, 50-70 per cent in rural areas to almost 90 per cent in areas where hookworm is endemic (Prema, 1989, p. 160).

In studies conducted in India, a high association between anaemia, prematurity, and low birth weight has been found (Prema, 1978; Raman, 1987). In a study by Agarwal *et al.* (1991), effects of the iron and folic acid supplementation during pregnancy is evaluated. Among the study group, haemoglobin and serum ferritin levels increase significantly while mean birth weight amounts to 2.88 kg. and the percentage of LBW children is 20.4 per cent. In the unsupplemented group, these figures are 2.59 kg. and 37.9 per cent respectively. However, other studies show that the prophylaxis programme does not really affect the prevalence rates of anaemia. Due to unpleasant gastrointestinal side effects, compliance is low (Prema, 1989). Vijaraghavan *et al.* (1990), however, state that acceptance by the community is satisfactory, but that the coverage is poor due to inadequate and irregular supplies, and an improper orientation of the health functionaries.

Smoking, alcohol, and drugs. Smoking has a minor effect, if any, on maternal weight gain (NAS, 1990), but a major independent impact on IUGR (Kramer, 1987; Naeye, 1981). A study in India, where tobacco chewing is popular, indicates the negative effects of this habit on birth weight and height of the child (Verma *et al.*, 1983).

There seems to be no independent effect of alcohol on weight gain of women and although a study indicated effects of drugs on maternal weight gain, it is not clear whether this is an independent effect or whether other factors (like age, food intake) confound (NAS, 1990, p. 115). Effects of alcohol on birth weight have been reported: effects occurring when more alcohol (> 2 drinks a day) is consumed. The effects of drugs on birth weight have been difficult to prove (Kramer, 1987).

Other intervening variables. With regard to prematurity, both in developing and developed countries, among women with a **history of prematurity and spontaneous abortions**, the risk of giving birth to a premature child is higher. In general, **boys are heavier than girls** (Kramer, 1987; Vivekananda Murthy *et al.*, 1990). **Low birth weight of the mother herself** has a probable effect on intra-uterine growth of her child (Kramer, 1987).

Length of last birth interval and its influence on weight gain and birth weight remains a factor for which more research is needed (Kramer, 1987). He concludes that it is unlikely that short pregnancy intervals are an important cause of IUGR, at least in the USA. However, in developing countries, length of last birth interval might be a marker of prepregnancy weight-for-height status. Presumably women experiencing a short birth interval have less time to recover from the last pregnancy, which is reflected in their prepregnancy weight-for-height status. However, in India, Prema (1978) found that birth weight remained unaltered with variations in birth interval (less than 12 and up to 48 months).

Neither does evaluation of studies on the direct effect of **antenatal care** on IUGR or gestational duration lead to convincing conclusions. Only with regard to the quality of antenatal care some positive relationships are found. A study by Kapoor *et al.* (1985) in India indicates that women who receive antenatal care consisting of at least three visits, reception of two doses of tetanus injection, and consumption of 100 tablets of iron and folic acid, experience a significantly lower percentage of low birth weight children and a lower rate of perinatal deaths (Kapoor *et al.*, 1985).

In developing countries, **season** might be a factor related to weight gain and birth weight. The availability of food, agricultural work to be done, and the incidence of malaria differ between the seasons. In the same way, **socio-economic status** is related to food intake and amount of work. One of the studies, reporting seasonal effects was conducted in the Gambia (Lawrence *et al.*, 1986 and 1987; Lawrence and Whitehead, 1988; Prentice *et al.*, 1987). During the rainy season, overall food intake is not adequate. This is reflected in a general loss of body fat among women amounting to four kg. In addition, most agricultural work has to be done in this season. Pregnant women who do not receive supplementation and who give birth at the end of the rainy season suffer an overall loss of fat of 4.7 kg., while those who are pregnant in the dry season, when no agricultural work has to be done, gained three kg. of body fat. In India, figures for rural Harijana show no significant differences in birth weight between the different seasons. The proportion of low birth weight children in winter

(November-February) was 38.2 per cent, while during summer (March-May) and the monsoon (July-October) proportions were estimated to be 38.4 and 39.7 per cent. The maximum mean birth weight (2,738 grammes) was found in the winter season, while the minimum (2,701 grammes) was found in the monsoon (Murthy and Makhija, 1988).

2.4. Effects of a reduction in food intake during pregnancy

Given this review of studies dealing with the relationship between nutrition during pregnancy, maternal weight gain, and birth weight of children, what are the probable effects of a reduction in food intake during the last trimester of pregnancy?

The studies conducted among low and middle income class women in Mexico (Hunt *et al.*, 1987) and among rural Philippine women (Tuazon *et al.*, 1986 and 1987) indicate a (slight) decline in energy intake over pregnancy. Women gain less weight than women in industrialized countries: on average 6.8 and 8.4 kg. respectively. But although the average birth weight in the Philippines was lower (2,885 grammes), in Mexico the mean birth weight (3,381 grammes) does not differ much from the average found in industrialized countries.

Another study on the effects of a (forced) reduction in food intake during pregnancy on maternal weight gain and birth weight has been conducted for the Netherlands (Stein and Susser, 1975). During the Dutch famine winter 1944-1945, average daily intake amounted to less than 1,500 calories. Both weight gain and birth weight are reported to have been negatively affected. Women in the second and third trimester of pregnancy gained on average 2.6 kg. less in weight than normal and their children weighed on average 300 grammes less (Stein and Susser, 1975, p. 72). However, as Hytten (1980a, p. 27) concludes referring to this research and other studies as well (like the Guatemalan study by Lechtig *et al.*, 1975)

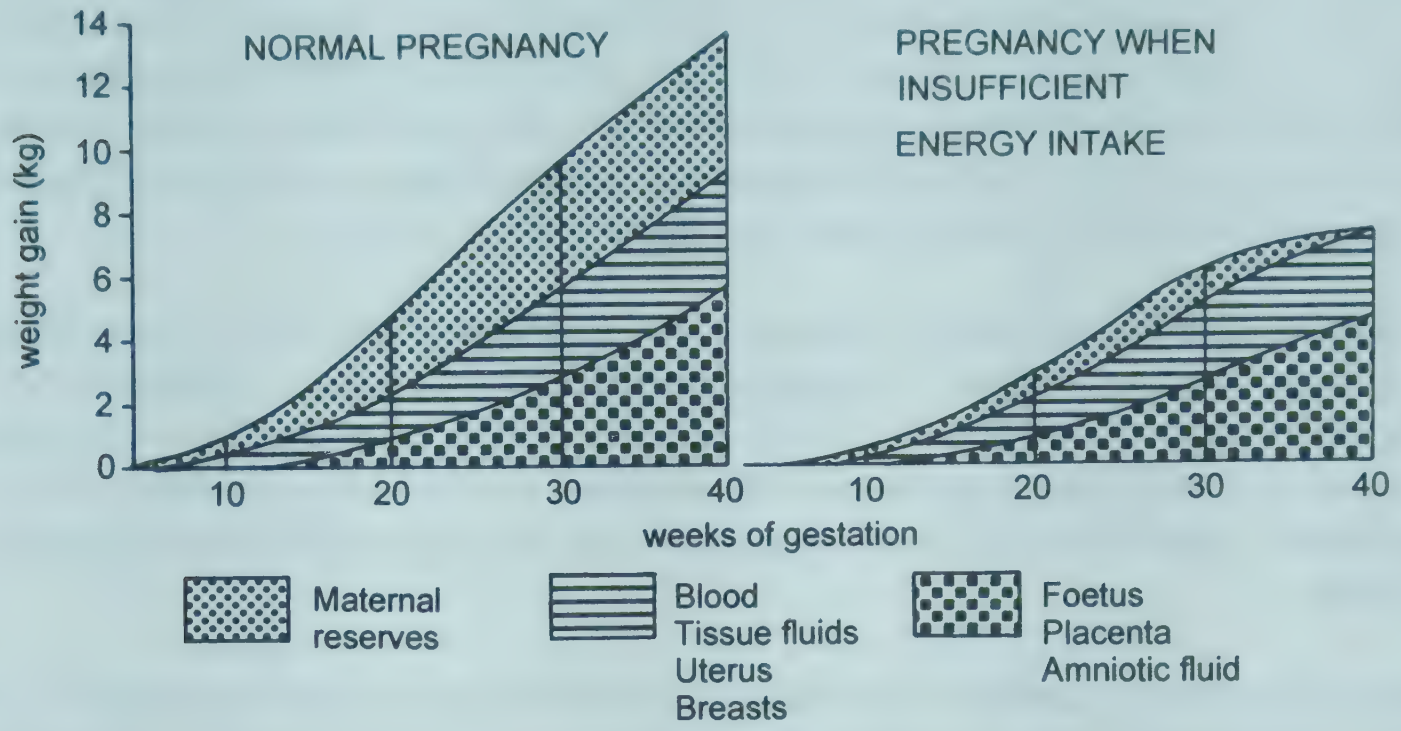
> "the fetus is remarkably safe and well protected from the vagaries of maternal food intake" and "the fetus will acquire nutrients at the expense of the mother, even to the extent of threatening her life".

Figure 2.6 illustrates this mobilisation of maternal fat, mentioned too by Lawrence *et al.* (1986). It shows that in the case of insufficient energy intake in the last trimester of pregnancy (when growth of the fetus is highest), maternal fat reserves (which are stored between the 10th and 30th week of pregnancy) are used for growth of the fetus.

Among women who are relatively wellnourished, like the women in the Netherlands were before the famine winter started, maternal reserves must have been sufficient to meet these energy requirements of the fetus. However, what happens if, as in many developing countries, women experience subsequent pregnancies with short birth intervals and are already in poor nutritional status when a next pregnancy starts?

In the Gambia (Lawrence *et al.*, 1986; Lawrence and Whitehead, 1988) pregnant women seem to be able to cope with a reduction in energy intake during the wet season by mobilization of maternal fat reserves and by saving energy through an actual decrease in basal metabolism and changes in physical activity. However, birth weight does decrease significantly.

Figure 2.6. Influence of low energy intake in the last trimester of pregnancy on weight gain during pregnancy



Source: ICC, 1985, p. 21.

The studies reviewed in Subsection 2.3.2 (Naeye *et al.*, 1973; Tripathi *et al.*, 1987; Bhatia *et al.*, 1983; Raman, 1987; Naidu *et al.*, 1991; Kusin *et al.*, 1993; Winkvist, 1992) are unanimous: women with a low prepregnancy weight-for-height status experience lower average birth weights.

Until recently it was uncertain (Merchant *et al.*, 1990a and 1990b) to what extent the health condition of mothers with poor prepregnancy nutritional status was affected during pregnancy and whether there were limits to maternal depletion to support fetal and infant growth. The more recent studies by Kusin *et al.* (1992 and 1994) in Indonesia indicate that at a minimum level of energy intake of 1,500 to 1,600 kcal., women with a low prepregnancy weight-for-height status gain more weight during pregnancy, suggesting that

> "pregnancy ... promoted weight gain of the women to the detriment of fetal and infant growth" (Kusin *et al.*, 1992, p. 15).

A possible explanation, formulated by Susser (1991) in a study of the effects of the famine winter, could be that under famine conditions there is a shift of the role of the placenta in the passage of nutrients from the mother to the fetus to the advantage of the mother.

In most studies reviewed, the health condition of the mother during pregnancy is indicated by weight gain. Maternal weight gain, however, can be related to an increase in fat but also to retention of water in the body during pregnancy, i.e. oedema. In the present study, therefore, the health condition of women during pregnancy not only will be measured by weight gain but also by the development of skinfolds and mid-upper-arm circumference (see Chapter 3).

2.5. Survival, growth, and development of children in the first month of life

In Subsection 2.1.4, newborns were classified according to birth weight, gestational age, and height. Each group has different chances of survival. Children who are proportionately SGA (Small-for-Gestational Age) or affected by IUGR (Intra Uterine Growth Retardation) (i.e. are 'stunted') result from "a long-term uteral placental vascular insufficiency which, among others, is related to pregnancies in mothers who are chronically malnourished, subject to multiple infections and having low energy reserves" (WHO, 1991, p. 12).

These children have a good survival chance in the beginning of life but are more likely to die later in infancy as a consequence of the damage experienced in utero. Children who are disproportionately SGA or affected by IUGR (i.e. are 'wasted') result "from pregnancies in which there is a short-term uteroplacental vascular insufficiency" (WHO, 1991, p. 12). These children experience a higher neonatal morbidity but have a higher potential for further development.

Regarding the growth potential of children, the following results are reported. Healthy premature children are able to grow at the same rate as fullterm infants of the same post-conceptional age. Fitzhardinge and Inwood (1989) found that premature children regained their birth weight within an average of 11 days. Among IUGR children, postnatal catch-up growth is more prevalent among the disproportionally affected ('wasted') children (Villar *et al.*, 1984).

Offringa and Boersma (1987) and Boersma *et al.* (1988, p. 220) compare the growth of infants from both industrialized and developing countries in the first month of life. Although their average birth weight has been estimated to be lower, children in the second group gain more weight than the others (over 300 grammes more). The difference was most obvious in the first days of life (Boersma *et al.*, 1988, pp. 216-219). After an initial loss in weight, children in developing countries regain their birth weight after four to five days, while children in industrialized countries reach this level after eight to ten days only (Boersma *et al.*, 1988; Mata, 1978; Offringa, 1990).

The data suggest that children in developing countries can catch up in weight. Growth velocity (grammes weight gain per kg. of body weight per day) in the first month of life of children in different, developing as well as industrialized, countries are presented in Table 2.2. A possible explanation for the higher growth velocity in developing countries is "an increased energy intake or a reduced energy expenditure, e.g. at night when the infant usually shares the bed with the mother (reduced heat loss, night-feedings) or a combination of both" (Boersma *et al.*, 1988, p. 217).

In our research project, we want to follow this last study and examine growth and development of children in the first month of life as well.

Given this review of studies, in the first part of the research, which focuses on the effects of a reduction in food intake during the last trimester of pregnancy on health condition of mothers and pregnancy outcome, the following variables are included (see Figure 2.7).

Table 2.2. Growth velocity (grammes weight gain per kg. body weight per day) in the first month of life (0-1)

Country	
United Kingdom	6.1
USA	7.8
Gambia	8.6
Singapore	9.1
Tanzania	10.5
Nigeria	10.1

Source: Boersma *et al.* (1988, p. 217).

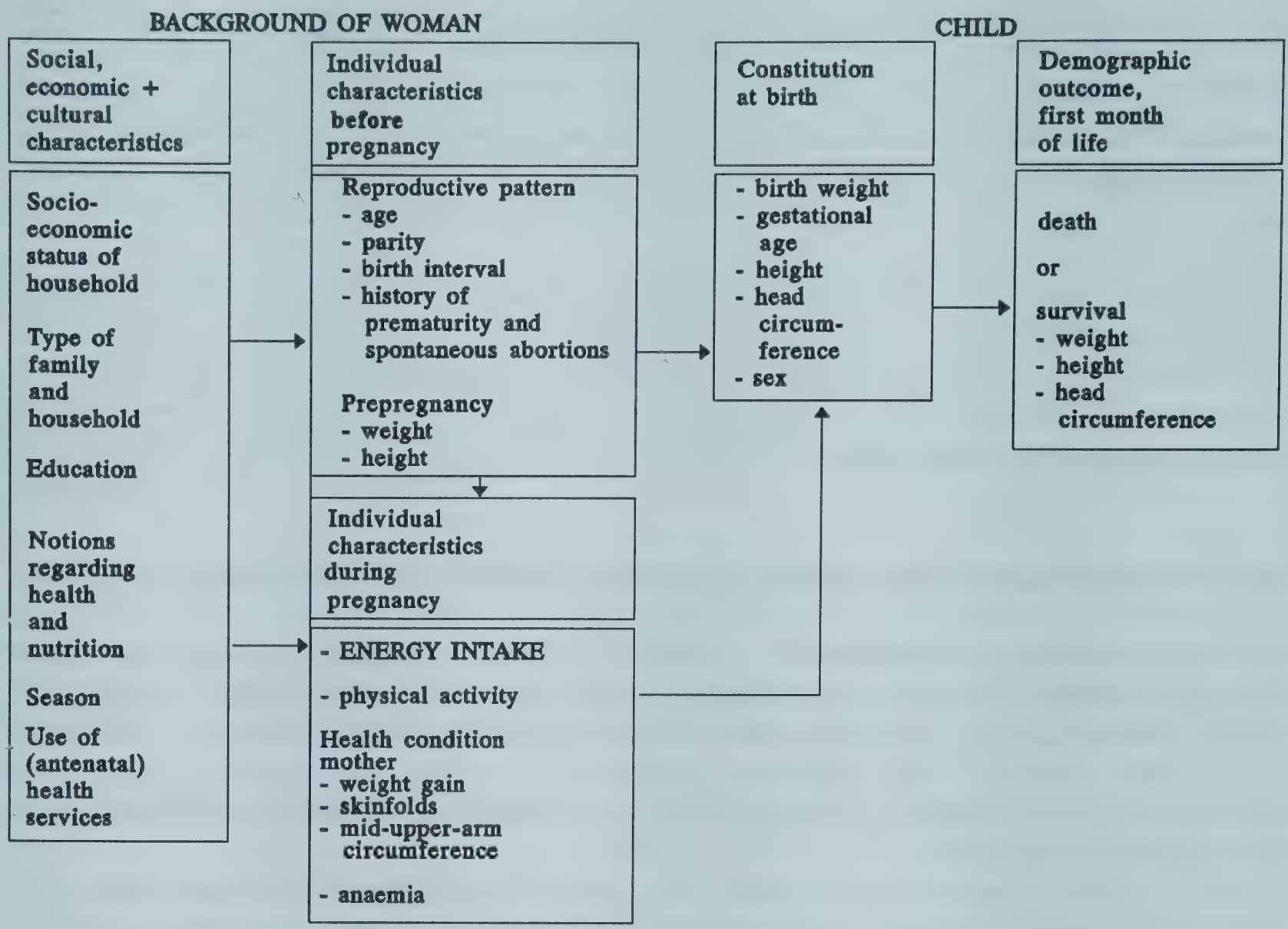
2.6. Determinants of reduction in food intake during the last trimester of pregnancy

As mentioned before, the literature generally states that the reason behind the custom of reducing food intake during the last trimester of pregnancy is that women hope to have a small child and thus an easy delivery (Hytten, 1980a; Ministry of National Planning, 1982; Kusin *et al.*, 1984; De Vries, 1987). However, some studies go beyond this limited explanation and give an inventory of other, more complex, reasons. Nichter and Nichter (1983) conclude that the common explanation

> "while relevant, tends to underestimate pregnant women's concern for the health of their babies" and "tends to gloss over a complex of ideas associated with notions of ethno-physiology and preventive health" (Nichter and Nichter, 1983, p. 236).

In this section, we elaborate on the possible reasons for a reduction in food intake during pregnancy. We focus on ecological, economic, physiological, social, and cultural factors related to food intake during pregnancy in general. Based on the literature only, we expect that the reasons for the custom of reduction in food intake during the last trimester of pregnancy are predominantly socially and culturally determined. Here, we come to the background factor included in the model of Van Norren and Van Vianen (1986) (see Figure 2.2), not mentioned until now, i.e. notions concerning health and nutrition. Based on the value-expectancy model of Fishbein and Ajzen (1975), a model for the determinants of nutritional behaviour during pregnancy is presented. The model not only offers a structure in which beliefs of respondents and the influence of 'important others' can be studied more systematically but also facilitates the identification of points of impact for future health education of food behaviour during pregnancy.

Figure 2.7. Factors included in the first, quantitative, part of the research



2.6.1. Factors determining food intake during pregnancy

In this section, we discuss the factors related to food intake during pregnancy in general. In the first instance, at the regional level ecological circumstances will determine which food crops can be cultivated in a particular area. In addition, availability of and access to food is determined by economic factors — and sometimes political factors as well. Moreover, cultural and social factors play a role. In every society, certain views exist with regard to which food can be consumed by whom and when. Rules applied to nutrition of women are often related to the reproductive cycle (Fieldhouse, 1985, p. 52): menstruation, pregnancy, and lactation are periods in which food taboos are very common.

At the individual level, availability of and access to food depends on socio-economic status of the household. Within the household, the way in which food is distributed among its members determines individual food intake. In India, for example, women take their own meals only when all other family members have finished theirs. As far as the food intake of pregnant women is concerned, the process of pregnancy itself, i.e. physiological changes, could play a role. For example, due to nausea in the first months of pregnancy, individual food intake can be lower than normal. In addition, individual food intake is determined by beliefs regarding what to eat during pregnancy.

With respect to the reduction in food intake during the last trimester of pregnancy we, subsequently, wonder which of these factors are relevant. Ecological and economic factors might be important. This would mean that reduction in food intake during pregnancy only takes place when a shortage of food, due to either seasonal or economic factors, occurs. The studies conducted in the Gambia (Lawrence *et al.*, 1986 and 1987) and in the Netherlands (Steiner and Susser, 1975) both report such a forced reduction. In the Gambia, pregnant women reduce their food intake during the wet season, a period of food shortages. In the Netherlands, women reduced food intake during the famine winter of 1944-1945, a period in which less food was available due to the second World War. However, the custom of reduction in food intake during the last trimester of pregnancy is reported to exist in different regions, independent of seasonal influences, and to be practised by women of different socio-economic groups. Women seem to lower their food intake precisely because they are pregnant.

Physiological factors, then, might play a role. The process of pregnancy itself might induce certain physiological changes evoking women to reduce their food intake during the last trimester of pregnancy. However, arguments against this presumption can be formulated. The literature suggests that the custom existed in nineteenth century Europe but nowadays is only practised by women in developing countries. If the reduction in food intake is purely a physiological reaction of pregnancy, would not women in industrialized countries also reduce their food intake during the last trimester of pregnancy? The longitudinal studies conducted in industrialized countries, like those by Van Raay *et al.* (1986 and 1987) and Spaay (1993) in the Netherlands, and Durnin *et al.* (1986 and 1987) in Scotland, Truswell *et al.* (1988) in Australia indeed indicate that women do not consume as much extra energy during pregnancy as recommended, but none of them mentions a —deliberate— reduction in energy intake during the last trimester. Neither does the review of the NAS (1990). In addition, the literature suggests that the reduction in food intake during the last trimester is a deliberate act — in order to have a small child. The literature therefore seems to indicate that physiological factors make no significant contribution to the custom of reduction in food intake.

Moreover, continuing the argument that women deliberately eat less during the last trimester of pregnancy, we expect that the custom is due to notions regarding nutrition and pregnancy. These notions or beliefs, which are culturally determined and shared by a group of people, are worked out in the next subsections.

2.6.2. Beliefs about food intake during pregnancy

The reason commonly mentioned in just one sentence, behind the custom of reduction in food intake during pregnancy is that women hope to have an easy delivery by giving birth to a small child (Hytten, 1980a; Ministry of National Planning, 1982; Kumar and Wallia, 1982; Kusin *et al.*, 1984; De Vries, 1987). However, this explanation seems to be too simple. In their study conducted in the state Karnataka, India, Nichter and Nichter (1983) conclude that the common explanation

> "while relevant, tends to underestimate pregnant women's concern for the health of their babies" and "tends to gloss over a complex of ideas associated with notions of ethno-physiology and preventive health" (Nichter and Nichter, 1983, p. 236).

In their research in South India, the authors found the opposite relationship between food intake during pregnancy and size of the child: women associate a reduction in food intake with a big child. If they ate too much there would not be enough room for the child to grow (Nichter and Nichter, 1983, p. 238). Also during our feasibility study in Dharwad area, women stated that by eating less food than normal their baby would be big and healthy (Hutter, 1990).

Another study conducted in the area (Reddy, 1988), however, found no perceived relationship between food intake during pregnancy and size of the child. As the author concludes, pregnant women

> "did not seem to believe that a woman can have a small baby and thus a quick and easy delivery if she consumed less food during pregnancy" (Reddy, 1988, p. 8).

Jeffery *et al.* (1989) who conducted research among pregnant women in rural Uttar Pradesh report that many respondents believed that excessive eating during pregnancy resulted in a large child. As a consequence the risks of delivery would be high. One of the respondents, who ate a lot during pregnancy was warned by others that this kind of behaviour would lead to a big child. However, when she gave birth to a small child, she was blamed for

> "eating so much that her tubes filled with food and the baby became cramped" (Jeffery *et al.*, 1989, p. 78).

Nichter and Nichter (1983) relate beliefs regarding food intake during pregnancy and size of the child to the following notions of ethnophysiology. Women believe that the fetus grows in the womb and stomach together, a space occupied by food and wind (Vayu, one of the three humours within the Ayurvedic medical system; see Chapter 4) and that

> "the more space is occupied by these other substances, the less space the fetus will have in which to grow" (Nichter and Nichter, 1983, p. 238).

Thus, by eating less during pregnancy, the fetus is able to grow big.

A huge amount of literature is available on beliefs with regard to the quality of food intake during pregnancy. Here, we focus on studies conducted in different parts of India (Khanum and Umapathy, 1976; Mullapudi, 1984; Pool, 1983 and 1987; Reddy, 1988; Jeffery *et al.*, 1989). These studies were conducted in different States in India and although differences exist in food behaviour, many similarities can be observed. One food item, commonly mentioned in these studies, to be avoided during pregnancy is papaya. Papaya, classified as heating, is supposed to induce an abortion. This belief too is related to the medical system Ayurveda, in which food is classified according to the diametrical concept of temperature, hot versus cold (Wandel *et al.*, 1984, p. 93). The avoidance of heating food (papaya, but also e.g. sesame, chillis, jaggery, meat, and eggs) again can be related to notions of ethnophysiology of pregnancy. Pregnancy is seen as a process of increasing heat, and excess heat —produced either by food or other heating items— is supposed to lead to an abortion. The studies mention several other food items to be avoided or to be added during pregnancy. A few examples: egg and jambu fruit are to be avoided since they cause red and purple patches on the child's face (Khanum and Umapathy, 1976); eggs too are supposed to cause the child to have a bald head (Mullapudi, 1984). During pregnancy, milk with saffron is added to the common meal pattern

as it is supposed to lead to a fair complexion of the child (Khanum and Umapathy, 1976). If pregnant women have a craving for bitter foods, the child is believed to be a boy, while a craving for sweet food indicates a girl (Jeffery *et al.*, 1989).

Beliefs regarding quantity and quality of food intake during pregnancy are related to beliefs regarding other proper behaviour during pregnancy. Das (1988, p. 203) states that in India

> "everything that the mother does during her pregnancy, the food she eats, the people she visits, the thoughts she has, the stories she listens to, all affect the character of the child".

2.6.3. Influence of 'important others'

Pregnant women have their own beliefs about food intake and other proper behaviour during pregnancy, but they will also be influenced by others. These important others might be either laypersons (e.g. family members) or specialists (e.g. traditional birth attendants or health workers). For this social aspect of food intake during pregnancy, in this section we briefly review the literature on the social structure of Indian society. This subject is extensively described in Chapter 4.

Traditionally, girls in India are only temporary members of their natal family (Dube, 1988, p. 168): at marriage they move from their own house to the house of their parents-in-law, and from that moment onwards belong to the husband's family. In this patrilinear system, women's status is highly determined by proven fertility. Women can improve their status within the family-in-law especially by giving birth to sons, implying continuation of the family line. In this situation, we expect that women will be influenced —in their ideas about food intake during pregnancy and ethnophysiology— by their female in-laws. The mother-in-law, in particular, is assumed to play an important part. Based on the feasibility study in Dharwad area (Hutter, 1990), we also expect female neighbours to play a role.

Another Indian custom is to send first gravida women to their parent's house to deliver (Mandelbaum, 1972; Srinivasan, 1976; Narayanan and Narayanan, 1981). Therefore, we expect first gravida women to be influenced by their own mother as well.

Most deliveries in this part of South India take place at home with the help of a traditional birth attendant, a dai (Jagdish *et al.*, 1983; Mathai, 1989; UNICEF, 1991). Traditionally, dais do not give antenatal care. Moreover, literature (Jagdish *et al.*, 1983, p. 143) shows that more than 60 per cent of all pregnant women in Karnataka do not receive any antenatal care. Therefore, with respect to the influence of important others regarding food intake during pregnancy, we expect dais and health workers to play a minor role.

All these concepts mentioned —the beliefs of the women themselves, the influence of important others, related background variables like the medical system Ayurveda— are integrated into one model for determinants of nutritional behaviour during pregnancy. This model is described in the next subsection.

2.6.4. A model for determinants of nutritional behaviour during pregnancy

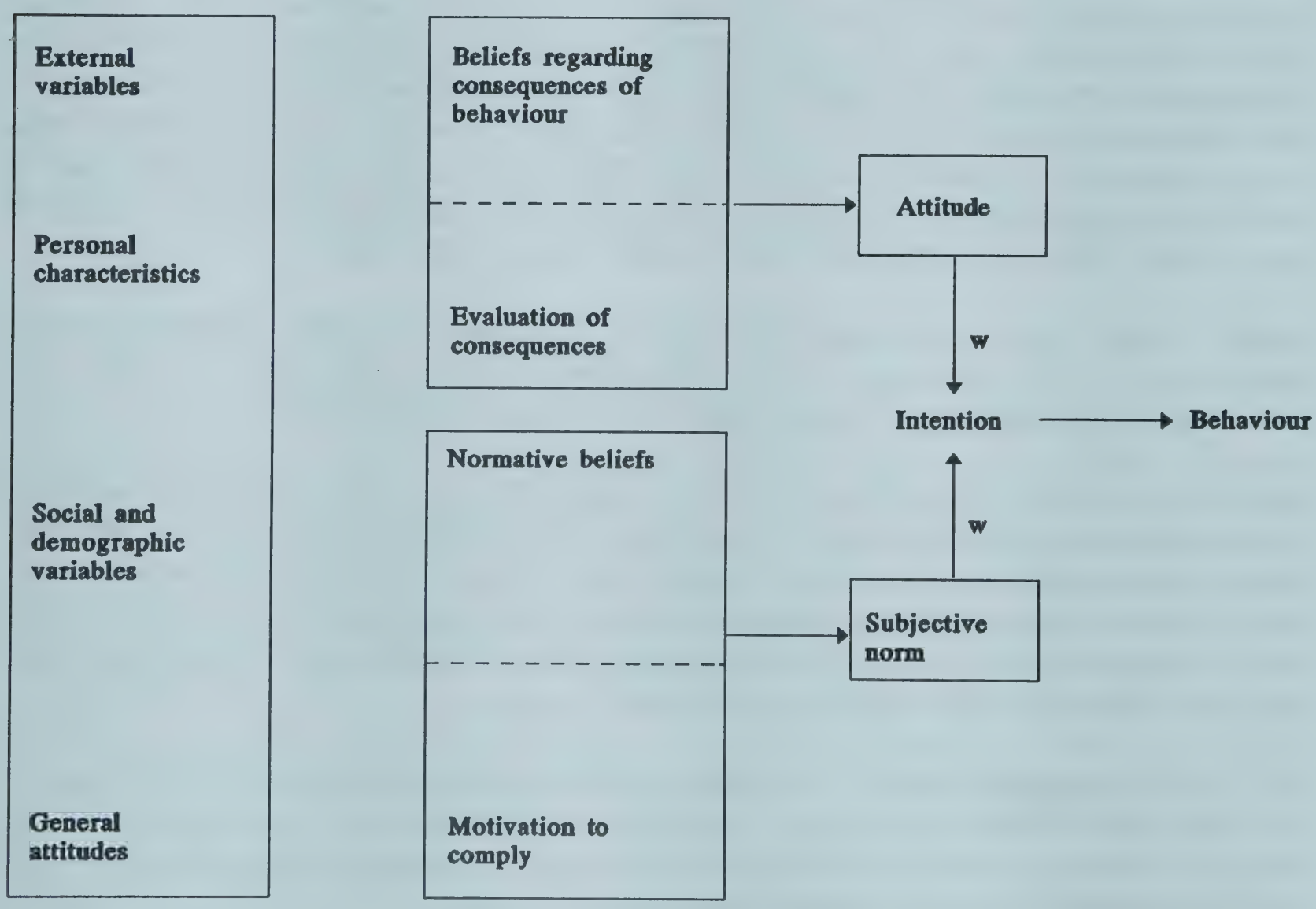
Fishbein and Ajzen (1975) formulated a value-expectancy model of reasoned action (see Figure 2.8, derived from Ajzen and Fishbein, 1980). In this model, reasoned behaviour is assumed

to be preceded by an intention to behaviour. A person's intention to perform a certain behaviour in turn is determined by two factors, a personal one and a factor reflecting social influence. The personal factor, the attitude towards the action is defined as the —negative or positive— evaluation of performing the behaviour. The second factor, the subjective norm, is the person's perception of social pressures put on him to perform or not to perform the behaviour in question (Ajzen and Fishbein, 1980, p. 6).

Attitude, in turn, is determined by beliefs regarding the outcome (or consequences) of a particular action and the evaluation of this outcome. The subjective norm is constituted by the person's beliefs that specific individuals or groups think he or she should or should not perform the behaviour (normative beliefs) and the motivation to comply to these others (Ajzen and Fishbein, 1980, p. 7).

In the model, factors like social and demographic variables and personal characteristics "do not constitute an integral part of the theory" (Ajzen and Fishbein, 1980, p. 9), but are considered to be external variables.

Figure 2.8. The value-expectancy model of reasoned action

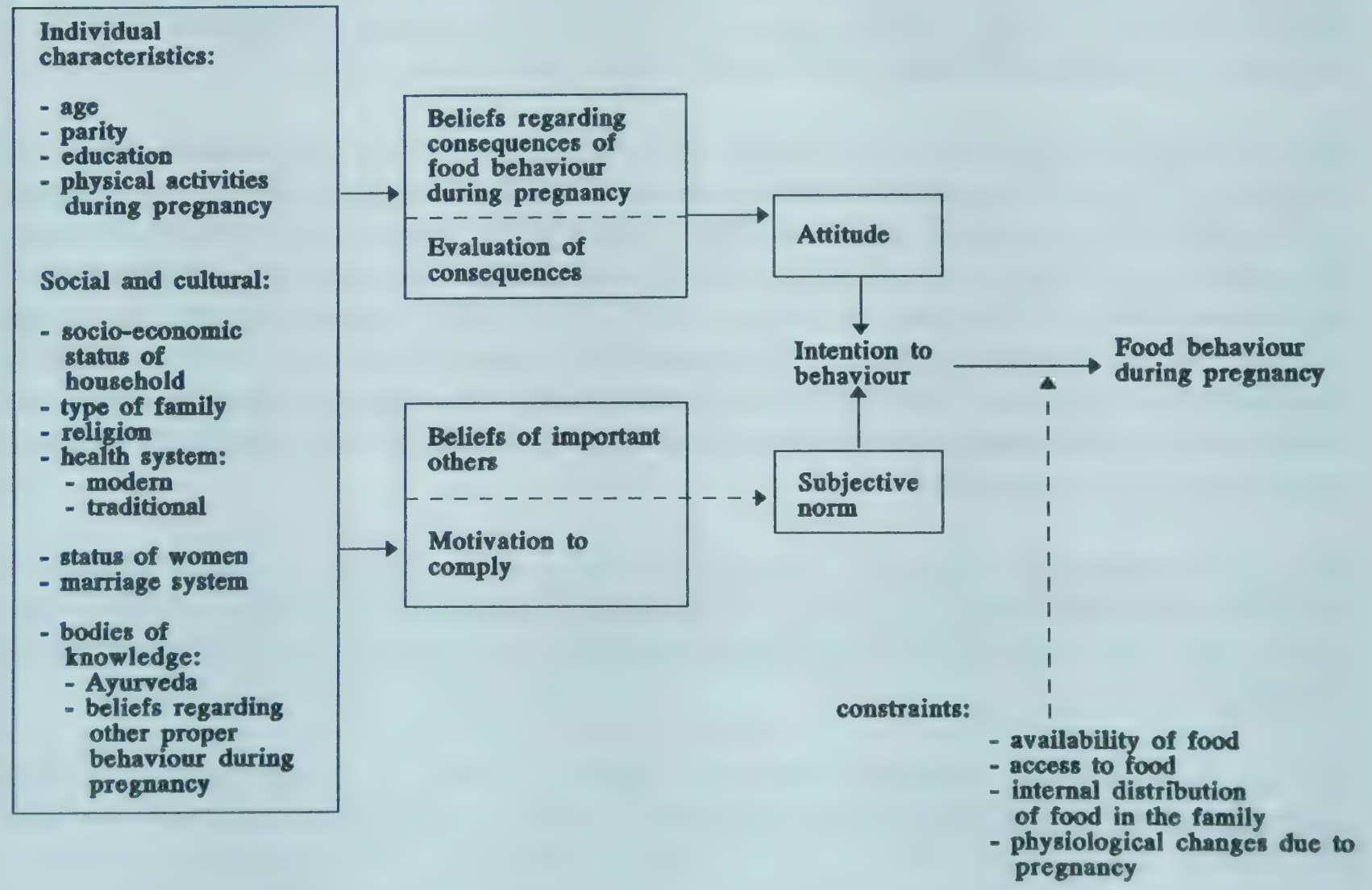


w = relative importance of attitudinal and normative considerations.
Derived from Ajzen and Fishbein (1980).

An intention to behave does not always result in actual behaviour: there might be an intention to behave but no possibilities to perform. Applying this model to our study, we integrate all possible determinants of nutritional behaviour during pregnancy in one model (Figure 2.9). In the remainder of this subsection, we explain this model and illustrate its components with some examples.

Nutritional behaviour during pregnancy incorporates both the quantity and the quality of food intake and is preceded by the intention to nutritional behaviour during pregnancy. Pregnant women might intend to reduce food intake in the last trimester or intend to avoid papaya. Intention to behaviour is determined by attitude and subjective norm. The attitudes are constituted by beliefs about the consequences of a particular nutritional behaviour and the evaluation of these consequences. Pregnant women, for example, might believe that the consequence of eating more during pregnancy is a big child, which, if evaluated negatively, leads to a negative attitude towards consuming more food during pregnancy. In the same way, women might believe that the consequence of eating papaya is an induced abortion which, evaluated negatively, leads to a negative attitude towards eating papaya during pregnancy.

Figure 2.9. A model on determinants of nutritional behaviour during pregnancy



Based on Ajzen and Fishbein (1980).

The subjective norm is constituted by normative beliefs and motivation to comply. A respondent might, for example, believe that her mother-in-law thinks that papaya must be avoided because it leads to abortion; she also believes that her own mother thinks she may eat everything during pregnancy. If the respondent lives in a joint family, she might be more motivated to comply with her mother-in-law than with her own mother.

This latter example brings us to the background variables related to beliefs of respondents and important others, and motivation to comply. We consider these factors not as external variables but as part of the model. An important objective of this research is to illustrate how nutritional behaviour during pregnancy takes place within a social, economic and cultural context.

Individual perceived consequences of food intake during pregnancy are related to general existing bodies of knowledge, of which the medical system Ayurveda is most important here. Nestled within Hindu religion and mingled with concepts of traditional medicine, this medical system generates classifications of food and notions of ethnophysiology. The classification of papaya as heating and the idea of pregnancy as a process of increasing heat are but two of these concepts. In addition, perceived consequences of nutritional behaviour during pregnancy will be related to beliefs regarding other proper behaviour during pregnancy.

There might be differences in beliefs between educated and non-educated women, between younger and older women, and between zero or higher parity women. These factors are all classified in the model as personal characteristics. In the same way, beliefs might differ between religious or socio-economic groups. Motivation to conform to important others will be related to background factors like type of family, parity or age.

In the model, attitudes and subjective norm form the intention to nutritional behaviour during pregnancy. Whether this intention induces actual food behaviour during pregnancy depends on the possibilities of conducting that particular behaviour. Economic or ecological constraints, like availability of and access to food, might play a role, as do social and cultural factors, like the internal distribution of food within the family. An example: Women might intend to eat more than normal during pregnancy, but extra food is not available in the household, or if it is available, it is not distributed to women. In addition, physiological constraints might play a role: women might intend to eat more than normal but the fetus pressing against the stomach leaves them with no appetite.

The model presented in Figure 2.9 not only offers a structure in which the determinants of nutritional behaviour during pregnancy can be studied systematically, but also facilitates the identification of points of impact for future health education on nutritional behaviour during pregnancy.

How all these variables, presented in both the Figures 2.9 and 2.7, are put into practice and measured will be described in the next chapter.

Chapter 3 Research questions, hypotheses, and methodology

Having extensively reviewed the literature in the last chapter, in this chapter we first work out the different research questions as presented in the introduction. Subsequently, we focus on methodology applied in the research.

3.1. Research questions and hypotheses

As far as the research questions are concerned, the study can be divided into a quantitative and qualitative part. The first focuses on the effects of a reduction of food intake during the last trimester of pregnancy, the second on the reasons behind such a reduction.

3.1.1. The quantitative part of the research

First of all, in this study we want to know whether the reported reduction in food intake during the last trimester of pregnancy can be confirmed by quantitative data on food intake and by how much the intake is reduced. In addition, we want to study whether all women eat less or whether this custom is only practised by a particular group of women.

Moreover, we want to examine the effects of a reduction of food intake during the last trimester of pregnancy among women whose nutritional status is already poor before conception on the health condition of women and pregnancy outcome. Based on information from different studies (presented in Section 2.4 which focuses on the research topic), we concluded that a reduction in energy intake during the last trimester of pregnancy in first instance will affect the mother's health. The maternal fat reserves, stored during the 10th to 30th week of pregnancy, will be reduced. The fetus grows 'at the expense of the mother' and the birth weight of the child will hardly be affected. Based on these studies we formulate the hypothesis that:

> In general, a reduction of energy intake during the last trimester of pregnancy will:
> - have a negative effect on the health condition of the mothers;
> - not affect the birth weight of the children.

However there seem to be limits to maternal depletion too: studies in Indonesia (Kusin *et al.*, 1992; Kardjati *et al.*, 1994) and Pakistan (Winkvist *et al.*, 1992) indicate that women with a poor nutritional status before conception, at a minimum level of energy intake during pregnancy of about 1,500-1,600 kcal., gain more weight during pregnancy. They gain weight at the expense of the children, who experience lower birth weights than children born to mothers with a higher prepregnancy weight-for-height status. Therefore, we specify the hypothesis:

Among women with a poor prepregnant nutritional status, a reduction of energy intake during the last trimester will:
- not affect the health condition of the mothers;
- but will negatively affect the birth weight of children.

In our research, health condition of the pregnant mother not only includes weight gain but also the development of skinfolds and mid-upper-arm circumference.

In Chapter 2, we indicated that birth weight alone would not be a sufficient indicator for the well-being of the child. Following other studies, we include in this research growth and development of children in the first month of life. Based on other studies, we expect that:

Children in India, like children in other developing countries, will show a higher growth velocity (compared with children in industrialized countries).

3.1.2. The qualitative part of the research

The next research question focuses on the reasons behind the custom of reduction in food intake in the last trimester of pregnancy, as perceived by the women themselves. In Chapter 2 we mentioned that, based on literature only, we expect that the reasons behind the custom of reduction of food intake are predominantly culturally and socially determined. Physiological factors were expected to play a minor role. However, during the implementation phase of the research project it became more and more clear that physiological factors might play a role as well. Verbal statements of medical professionals and pregnant women themselves suggested that at the end of pregnancy the fetus presses against the stomach leaving women with less appetite.

Specifying the cultural factor determining food intake during pregnancy, we expect that:

The custom of reduction of food intake during the last trimester of pregnancy is determined by:
- beliefs regarding food intake during pregnancy, which
  - are related to notions of ethnophysiology, and
  - are related to beliefs regarding other proper behaviour during pregnancy, and
  - are generated from a body of knowledge of which the medical system Ayurveda is most important.

In addition, specifying the social factor determining food intake during pregnancy, we expect that in the Indian situation women will be influenced —in their ideas about food intake during pregnancy and ethnophysiology— by the female members of the family-in-law. Especially the

mother-in-law is assumed to play an important part. Based on the feasibility study in Dharwad area (Hutter, 1990), we also expect female neighbours to play a role.

Given the custom of sending first gravida women to their parents' house in order to deliver there (Mandelbaum, 1972; Srinivasan, 1976; Narayanan and Narayanan, 1981) we expect first gravida women to be influenced by their own mother as well. During the fieldwork, however, it became clear that in reality higher parity women also leave their husband's house in order to deliver in their parents' house. Therefore, the hypothesis formulated on the basis of literature alone, i.e. only first gravida women are influenced by their own mother as well, was reformulated during the fieldwork period.

Given the fact that traditional birth attendants (dais) do not provide antenatal care and that the majority of women in Karnataka do not attend antenatal services (see Chapter 2), we expect dais and health workers to play a minor role.

Summarizing, considering beliefs with regard to food intake, to notions of ethnophysiology and to other proper behaviour during pregnancy, we expect that:

Women will be influenced:
- by female members of the family-in-law, especially the mother-in-law, and
- to a lesser extent by female neighbours, and
- by the own mother and female members of the own family as well.

3.2. Methodology

We want to depict the custom of reduction of food intake during the last trimester of pregnancy in a more complete way by studying not only actual food intake and its effects on the health condition of the mother and well-being of the child, but above all the intentions and beliefs underlying this particular nutritional behaviour. This requires an interdisciplinary approach to the problem, as nutritional, medical, demographical, anthropological, and sociological aspects are included in the research.

Within the field of demography, this research fits in with the so-called micro-approaches to demographic research (Caldwell, Reddy and Caldwell, 1982; Caldwell, 1988). Traditionally, demographers focus on large-scale surveys conceiving a statistical association, but no causal relationship between certain variables. In the micro-approaches, however, researchers want to understand and explain demographic processes and changes (Caldwell 1988, p. 464). This requires other methods than the commonly applied quantitative surveys. Methodologically, the micro-approaches are characterized by small-scale research in which predominantly anthropological methods like participant observation, in-depth interviews, and focus-group techniques are used. Large-scale surveys are not ignored but commonly utilized to provide background information.

In our research, quantitative methods are mainly applied to try to answer the first research question, i.e. what are the effects of a reduction of food intake during the last trimester of pregnancy on the health condition of women and the well-being of children. Data on food intake, weight gain of women, development of skinfolds, birth weight of children, growth, and development in the first month of life and on most intervening variables are collected by the survey method.

The main objective of the other part of our research is to explain and understand the custom of reduction of food intake during pregnancy. This requires application of small-scale, qualitative research methods like participant observation and in-depth interviews.

The study therefore combines both quantitative and qualitative approaches. The two are of course not mutually exclusive, but do intertwine. For example, the survey on pregnancy histories required knowledge about local concepts which could be obtained through the interviews only.

This need for small-scale research also determined the selection of the research area and the research villages (Section 3.3). In the next sections, we focus on the actual fieldwork, which started in December 1990 and lasted twenty months, until August 1992. We discuss the fieldwork according to this twenty-month period and start with a description of the first preparation and the implementation of the census in Section 3.4. The main objective of the census, besides establishing rapport with the study population and collecting background information on the research area, was to gather data on household composition, in order to select women who might become pregnant in the forthcoming months.

This group of potentially pregnant women, described in Subsection 3.5.1, was followed throughout the remaining fieldwork period: weight, mid-upper-arm circumference, and date of last period were measured each calendar month. From this group of potentially pregnant women, the pregnant women were selected (Subsection 3.5.2). The final group of 186 pregnant women was followed throughout their pregnancy up to one month after delivery (Section 3.6). Food intake, skinfold thickness, and anaemia were measured in different months of pregnancy (Subsection 3.6.1). In addition, data on pregnancy histories and physical activities conducted during pregnancy were collected (Subsection 3.6.2). In the last section regarding the quantitative part of the research, the birth weight of children and their development in the first month of life is discussed, while in Section 3.7, the qualitative methods of research, participant observation, in-depth interviews, and focus group interviews are described.

3.3. Selection of the research area

As mentioned before, the research required small-scale research, and the selection of the research area was determined by this requirement. In this section, we describe how the research area and research villages were selected. Decisions were made based on the feasibility study conducted one year before the actual fieldwork started.

3.3.1. The feasibility study

A few years ago, a research cooperation was established between the Department of Demography at the University of Groningen in The Netherlands and the India Development Service (IDS), a non-governmental organization (NGO), at Dharwad in the state of Karnataka. Groningen University was approached to analyze data collected in the villages in which IDS conducts its activities (Lindeboom and De Vries, 1988; Lindeboom, 1989; Lindeboom and Themme, 1989).

The same NGO was involved during a feasibility study on nutrition during pregnancy in the Dharwad District (Hutter, 1990). The objective of this feasibility study, conducted in October/ November 1989, one year before the actual fieldwork started, was to examine the scientific and social relevance of a study on nutrition during pregnancy in this particular area. With the help of IDS, several villages located in two different regions of the Dharwad District were visited and interviews among pregnant women and key informants were conducted.

The IDS, a rural development organization established in 1974, focuses on grassroot development by organizing programmes which meet the needs and priorities indicated by poor people themselves. Its programmes concentrate on improvement of economic circumstances (by stimulating income generating activities), and on topics like health, dairy raising, and recently also on environmental issues. Creating awareness plays an important part. The health programme emphasizes preventive aspects such as the mobilization of people for immunizations and health education aimed at prevention of the most common diseases. Traditional birth attendants in the villages are mobilized for additional training. Village Health Workers (VHW), selected by the community and living in the villages, are trained by IDS staff in the basic principles of health. These VHWs, who are able to treat some basic health problems, visit poor families in the villages on a regular basis (IDS, 1981).

One of the conclusions of the feasibility study was that research on the custom of reduction of food intake during pregnancy in this area would be both scientifically and socially relevant. Most women who were interviewed stated they ate less food at the end of pregnancy, as eating less would lead to a big and healthy child (Hutter, 1990). In addition, the feasibility study indicated that the area most suitable for the research would be the rural area around the city of Dharwad. Dharwad, a small district town, is an educational centre and provides an excellent research infrastructure. Besides Karnatak University (Department of Anthropology) where local guidance was kindly offered, library and research facilities could also be found at the University of Agricultural Sciences and the Population Research Centre.

3.3.2 Selection of the research villages

In the selection of the research villages, several considerations were taken into account. The nature and vastness of the proposed research project were two of the most important criteria. Pregnancy and child birth are sensitive topics to study and collection of data on this subject requires a strong rapport between the researcher and respondents. The process of establishing rapport takes time and the researcher, being an outsider and a foreigner, could not expect to be easily and quickly accepted in an Indian village. Considering too the vastness of the study, a first introduction by an organization known in the villages and recognized by the inhabitants was considered to be very helpful. Therefore, we decided to select from those villages in

which IDS conducts its activities. The organization kindly offered assistance in introducing the researcher, which we gratefully acknowledge.

A further selection of research villages was made, taking two more considerations into account. First of all, we wanted to compile a sample of 200 pregnant women. This could be reached by covering a total population of ± 13,500 people, a figure calculated as follows: the Crude Birth Rate (CBR: number of live births per 1,000 population in a year) for rural areas in Karnataka is estimated to be 30 per 1000 (census 1981). The time available to conduct the research on pregnant women would be sixteen months, leaving seven months to find women becoming pregnant and to follow them throughout their pregnancy. On average, assuming an equal division of births across the year, in this seven-month period 17.5 births per 1,000 population would occur. In order to compile a sample of 200 pregnant women, and taking into account a margin of 15 per cent, 13,500 people had to be covered in the research population. Secondly, we narrowed down the number of villages by choosing those villages in which a Village Health Worker of IDS works and lives. This decision was based on the idea that without the help of these VHWs, data —such as those on birth weight within 24 hours after birth— would be more difficult to collect. The number of people living in these villages was estimated to be around 12,500. As a consequence, the research population consisted of people living in eleven villages located in Dharwad *taluk* (see Chapter 4).

Beforehand, we were aware of eventual drawbacks of an introduction in the villages by a known organization: people might associate us with the IDS and reply accordingly. Indeed in the beginning of the project, people asked what we could do for them, what help were we offering. However, after some time we were recognized as an independent research team (see later). In retrospect we can conclude that the decision to select villages in which IDS conducts its activities has proven to be essential for the success of the project. Being an outsider and a foreigner, the researcher would not have been easily accepted in a strange Indian village: the first introduction in the villages by a team of IDS proved to be very helpful. The presence of community organizers in the villages, their knowledge about village life, and their acquaintance with the inhabitants was most important for a further introduction in the villages and the selection of research assistants.

3.4. The fieldwork: preparation and census

In the following sections we describe the fieldwork period which lasted for a total of twenty months. First, we deal with the work preceding the actual research on pregnant women: the preparation for the fieldwork and the implementation of the census.

3.4.1. Preparation

The phase of preparation for the fieldwork (one month) in Dharwad involved several matters. In addition to practical and organizational matters like starting the procedure to select research assistants, constructing the census questionnaire, organizing transport facilities, purchasing materials needed for the census, and starting to learn the local language Kannada, a first introduction in the research area took place. With a health team of the IDS, the main villages were visited in the evening time. During these visits, the researcher was introduced to a large proportion of the inhabitants and the objectives of the research project were explained.

With the help of the community organizers of IDS, seven assistants were selected from the villages. As English was the only way to communicate during the first months, a first criterion for selection consisted in an active knowledge of this language. Moreover, a minimum level of education of secondary school (SSLC) was required, and given the topic of the research, there was a strong preference for female assistants. The first and last criteria appeared to be most problematic: few people in the villages —and certainly very few women— speak English. However, ultimately we were able to select seven assistants, four men and three women, whose English was sufficient. During the census, participation of male assistants was no problem. Later on, when the actual research on pregnant women started, the composition of the research team had to be changed. The educational background of the assistants was higher than required, the minimum level being the first year of pre-university course (PUC1). Each of the assistants, who lived in five different villages, were assigned work within their own village plus nearby villages. The decision to assign work in their own villages was based on the same idea as the one which played a role in the selection of research area and research villages. In order to gather information about sensitive topics like pregnancy and birth, working with someone acquainted with the inhabitants would make it easier to inspire confidence and establish a rapport with the inhabitants. Of course, it also could have adverse effects, as an example will show later on.

In an initial session, the research assistants were informed about the objective of the research. In subsequent sessions, they were asked to describe their village and draw a map. The objective of the questionnaire of the census was described, some concepts explained, and in some cases adjusted to the local context. A first attempt was made to make a local calendar. The training further consisted of role plays in order to learn how to interview and conduct the census. The questionnaires were pre-tested in the village, problems were discussed and questions readjusted. Alongside an English version of the census schedule, the Kannada version was prepared.

Before starting the census, a more personal introduction in all the villages was organized. The researcher visited important persons in the village like religious leaders, *panchayat* members and *swamijis* (see Chapter 4) with each assistant to explain the objectives of the research project. In this way, a start was made to present the staff as an independent research team.

3.4.2. Census

The main objective of the census, besides establishing rapport with the study population and collecting background information on the research area, was to gather data on household composition in order to select those women who might become pregnant in the forthcoming months. As shown in the first section of this chapter, the total population in the villages selected was estimated to amount to approximately 12,500 people.

After their training, the assistants started their work of collecting census data. In weekly meetings in the villages, the collected data were discussed with the researcher. After completion of a census questionnaire, the house was marked by attaching a small card —protected by a plastic cover— displaying the household number. This was necessary, especially in the larger village of Mugad, to be able to trace women who would become part of the longitudinal survey. Within three months the census was completed.

All members living in the household were enumerated (see census questionnaire in appendix E). We counted only those people who actually lived in the household. Daughters with their children who had come back home to give birth, for example, were excluded. The assistants were instructed to interview the head of the household. A household was defined as a group of people who prepared their food in the same kitchen and who kept a common household account. In the villages, family-related people may reside in one house but form different households. Each group occupies its own part of the house with a separate kitchen and keeps a separate household account.

The socio-economic status of the household was measured by several variables. The first questions in the census deal with religion and caste groups while the next refer to total income per year. These latter data reflect a trend within the village —the rich and poor obviously being distinguished— although the exact figures might be biased. Income is a sensitive topic and not everyone revealed the interviewer their real income, either for fear of tax demands or to depict themselves as below the poverty line and thus qualify for assistance from government schemes. A yearly income of 3,600 rupees, for example, is the upper limit to receive government support: many people mentioned this as the income they earned. Moreover, not all income includes money. A carpenter working in the village for several families receives a certain amount of paddy per year. To estimate the economic status of a household, the amount of land owned is a better indicator. Although here too government schemes might lead to a bias: limits of 2.5 acres and 5.0 acres are used for small and marginal land respectively. Irrigation discriminates further: it enables cultivation of cash crops like sugar cane and banana. Also, the number of animals possessed reflects material well-being. Bullocks, buffaloes, and cows are important assets. Further questions on socio-economic status focus on type of housing, source of water supply, possessions of the household, and the way of cooking. The last variable might be discriminatory for economic status: recently some families changed from fuelwood to gober gas.

Further questions in the census focus on the composition of the household. All members are characterized by sex, age, marital status, and education. The latter variable was defined as the highest level of education achieved. To help measure age, a local historical calendar was used. A list of important events in the last decades and a summary of festivals throughout the year was constructed. The calendar was developed together with the assistants and contained not only national events like the murder of Mrs. Gandhi in 1984 or important events related to agriculture —like the land act of 1974— but especially local events — like the construction of a village temple or death of a village leader. However, even with such a calendar, the age of adults remains difficult to estimate. By relating it to marital status, made operational by age at marriage and years married, and by relating family members to each other, a certain consistency in the data could be reached. Furthermore, it appeared to be very useful to work with assistants living in the villages themselves. As they knew almost all the inhabitants, they developed excellent ways to estimate age. They started to relate the age of the informants to the age of other inhabitants or to events (death, birth, or marriages) which occurred to them. Even so, if we look at the age distribution of the population, age heaping for ages with digits of zero and five and for age twelve were observed (De Boer, 1993).

The age of the children was relatively easier to estimate due to the presence of the parents. Festivals —abundant in India— turned out to be the most important events to relate to dates

of birth (see local calendar in appendix D). Some of the recent dates of births could also be found at the *anganwadi* (kindergarten) school where the teacher registers dates of birth of children born in the village. Depending on the village, this registration has been conducted since the last five to ten years.

Furthermore the census collected data on demographic events: births and deaths in the last year. As one of the main objectives of the census was the selection of women who might become pregnant in the forthcoming months, the question of whether any member of the household practised family planning was important. Women who had undergone sterilization, the most commonly used method of family planning in India, could be excluded from the sample of potentially pregnant women. In a few cases, this exclusion turned out to be erroneous: two women became pregnant although they had had a sterilization operation.

3.5. The fieldwork: potentially pregnant women

With the aid of the census, women who might become pregnant in the forthcoming months, the so-called potentially pregnant women, were selected. In this section, we first describe this group and the measurements taken. Subsequently, we discuss how the selection of pregnant women took place.

3.5.1. Survey among potentially pregnant women

The objective of a survey among potentially pregnant women, selected through the census information, was twofold. First, to select women as soon as they became pregnant. Second, to collect data on the variable prepregnancy weight-for-height status.

Which women were selected? First of all, women who were married, actually lived with their husbands, and had not yet undergone a sterilization were selected. An upper age limit of 45 years was applied, while the youngest married women appeared to be 12 years old. The women in this group might become pregnant in the forthcoming months. Secondly, as the reduction of food intake takes place during the last trimester of pregnancy, women who were already in the fourth, fifth, or sixth month of pregnancy were also selected. This group of women immediately constituted the actual study population.

Initially, of the total number of married women in the reproductive age group approximately 1,000 were at risk to conceive and were subsequently selected for participation. However, during the remaining study period of fifteen months, a number of women (about 100) appeared not to be at risk. Young girls, reported as member of the household and thus selected, turned out to have undergone a child marriage and were still living with their own families. Some women moved to other places, while others stayed at their parents' house due to personal circumstances. Others appeared to be sterilized, but had not mentioned this in the census. And a few women died in this short period.

This group of potentially pregnant women was monitored by the research assistants on a monthly basis. For male assistants, questions regarding the date of last period and pregnancy would be difficult to pose and therefore some adjustments in the composition of the research team were made. One of the male assistants was replaced by his wife. However, rural women

who speak English are rare and for the other male assistants another solution had to be found: they got support from a female helper. Before starting the survey, all assistants were trained in anthropometric measurements by the two nutritionists (counterparts; see Subsection 3.6.1) and the researcher.

The group of potentially pregnant women was followed on a monthly basis, their height, weight, mid-upper-arm circumference, and date of last period being estimated (see questionnaire A, appendix E). Originally, we also intended to measure skinfold thickness as an indicator of nutritional status before pregnancy. However, the educational level of the assistants was not sufficient to put this into practice. The anthropometric measurements were taken according to Jelliffe (1966), and Weiner and Lourie (1981).

Weight was measured with the help of simple bathroom scales with a division of 500 grammes. The assistants were instructed how to weigh the respondents. The scales had to be placed on a flat patch of ground (sometimes difficult to find in the village houses) and before measurement took place, the machine had to be calibrated with a weight of two kilogrammes. Women were asked to stand straight on the weighing scale, wearing only their normal clothes, such as cotton *saree*, skirt, and blouse piece. On average, these clothes, worn by almost all village women, weigh 850 grammes.

Height was measured with tape attached to a stick. With a ruler on top of the skull, height was read. This variable was measured for three consecutive months to establish the reliability of the measurement. Mid-upper-arm circumference was measured with an inflexible tape, at the part of the upper arm as indicated by Weiner and Lourie (1981).

For the female assistants it was not difficult to gather information on date of last period. First of all, several rules regarding menstruation —most of them related to the idea of pollution— exist in this society and as a consequence a menstruating woman is easy to detect. In orthodox families this implies that a woman must 'sit outside': she is not allowed to enter the kitchen, and must sit and eat separately. She should not touch children because this would influence them badly — unless some precautions are taken (see also Chapter 7 and Chapter 8). Another example of a —less strict— rule consists of the compulsory head bath at the end of menstruation. Further, women relate the date of their menstruation to full and new moon, both important events in this society (see local calendar in appendix D). Statements on date of last period therefore, e.g. 'three days before new moon'— were easily translated to the western calendar. Not only did the women themselves seem to know the date of their last menstruation. Repeatedly, mothers-in-law, keeping an eye on their daughters-in-law and wondering whether they would be pregnant or not, gave the (right) answers.

3.5.2. Selection of pregnant women

From the group of potentially pregnant women, those women who reported being pregnant were selected for participation in the survey on pregnant women.

In the remaining fieldwork period we were able to select over 200 women from this group of potentially pregnant women, although some dropped out before the end (see also Chapter 5). Either their pregnancy was discovered too late or they left for their parents' house to deliver, which was too far away from Dharwad.

This latter custom, most of the women (68.3 per cent, see Chapter 5) leave their husband's house —and thus the research villages— to deliver in their parents' house, was one of the more problematic aspects of the research. Although this custom is obligatory only for the first delivery, in fact women of higher parity also leave (see Chapter 5). From an organizational point of view, the decision had to be made to select only those women who stayed in the village for delivery and those whose native house was located within a distance of 30 kilometres from Dharwad. Luckily, most of them did stay within this radius. However, it meant that in addition to the eleven research villages about eighty to ninety other villages had to be visited.

Only after her own confirmation of pregnancy —usually during the third or fourth month— was the woman included in the study population of pregnant women. Estimation of how far pregnancy had progressed sometimes caused confusion. The research team first worked with calendar months, whereas the women appeared to relate it again to full and new moon, a pregnancy thus lasting ten lunar months. Another example of confusion in the procedure to select pregnant women can be mentioned here. One assistant suddenly reported a large number of pregnant women in his village. After checking all these women, it turned out that only a few of them were really pregnant. What had happened? Under some special government schemes for wage labourers, financial support for the first two deliveries (300 rupees) is given. Women can apply for this support through the local government nurse. As the research assistant was married to the local nurse, the women in the village associated him with the government too. Thinking there might be a new scheme and more money available, the women stated that they were pregnant.

Ultimately, the study population consisted of 186 pregnant women who were followed throughout pregnancy. The different measurements which took place among pregnant women are described in the next sections. In Section 3.6 the quantitative part of the research is discussed, in Section 3.7 the qualitative part.

3.6. The fieldwork: pregnant women and their children

In this section, all the different parts of the longitudinal, quantitative survey of pregnant women are presented. First of all, the nutritional and anthropometric surveys are described. The surveys on pregnancy histories and on physical activities conducted during pregnancy are discussed in the second part. The last subsection goes into the measurements of the child immediately after birth and one month later.

3.6.1. Nutritional and anthropometric survey

The objective of the nutritional survey (see questionnaire B, appendix E) was to collect information on actual food intake of women during several months of pregnancy and to examine whether women really lower their food intake in the last trimester. During the in-depth interviews (see Subsection 3.7.1), most women reported that they ate less during the last months of pregnancy. However, in the cultural context it is not easy for women to state that they eat more. The objective of the survey on anthropometric measurements (see questionnaire C, appendix E) was to collect data on the nutritional status of women during pregnancy.

This part of the research was conducted by two nutritionists who worked as counterparts in the project. Most of the information presented here is derived from their research reports (Jayalakshmi and Angadi, 1991; Angadi and Hosmath, 1992). The female nutritionists were selected via the Home Science College, Nutrition Department of the University of Agricultural Sciences at Dharwad. Near the end of the research period, one had to quit her job. The other could not finalize the fieldwork on her own, the most important reason being that an unmarried Indian woman is not supposed to drive alone on a scooter to the villages. Therefore, for the last two months of the fieldwork, one of the assistants accompanied this nutritionist in the field. Another graduate from the college was found to assist in the calculation of nutritional values.

The nutritionists studied food intake and measured skinfold thickness, anaemia, health status as perceived by the respondents, use of medical services and antenatal check-ups. We intended to take these measurements five times during pregnancy: in months three or four, five or six, seven, eight, and nine. However, this number of observations could not be conducted for all women in the study population. Measurement in month three/four of pregnancy was not always possible as women had not yet confirmed their pregnancy. The low number of measurements in month nine of pregnancy was due to the custom of women leaving their husband's house in order to deliver in their parents' house. The fact that more than eighty other villages had to be visited, made it impossible for the nutritionists to follow these women. In addition, for a sample of women (N=62) food intake in the first months after delivery was also measured.

In order to estimate food intake, the 24-hours-recall method was executed on three consecutive days. A small proportion of the data was gathered on two consecutive days, for two reasons. First, during the peak of the rainy season, the nutritionists could not reach all the villages and time lost had to be compensated by measurement on two days. Secondly, after resignation of one of the nutritionists, for the last two months of the fieldwork the work had to be carried out by one person only. Observation on three consecutive days would be too much to deal with, so these measurements were also conducted on two days. Given the low level of variation in daily food intake, we expect the differences between two or three days of observations to be minimal. The measurement took place on 'normal' days, which means that food intake was not measured on festival days, when special food is eaten.

For measurement, the method used by the Home Science College, Department of Nutrition and described by Pai (1987)[2] was applied. The materials used consisted of twelve vessels standardized for the most common recipes in the rural Dharwad district and spoons of 2.5, 5, 10, and 15 ml. Starting with a description of the food pattern the day before, first of all the raw amount of food used for the whole household was assessed. These raw ingredients were measured by means of either the twelve standard vessels, the spoons, or local measures of volume. The latter —such as *chataku* and *seru*— are especially used by women to measure grains and flour. The variation —changes having taken place over time— in these standards was confusing: some women used a *chataku* of 250 ml, others one of 200 ml. This meant that

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[2] We gratefully acknowledge the help and support provided by the Home Science College, Department of Nutrition, University of Agricultural Sciences, Dharwad. In our research, we could make use of the standard measures developed by them for this particular area of India.

each pregnant woman had to be asked to show her own standard; the content was noted on the form. Based on the amount of raw food used for the whole household, individual food intake of the pregnant woman was estimated. The amount of cooked food was measured again with the help of the standardized vessels. Later on, the nutritive values (like kcal., proteins, calcium, and iron) were calculated using the food composition table for India (Gopalan *et al.*, 1989; ICMR, 1990). Let us take the example of the staple food *rotti*. *Rotti* is a kind of pancake made of jowar (sorghum). Its thickness and thus its nutritive value varies. First of all, the total amount of flour used for the whole family (given in local measures of volume) was calculated. Then, knowing the number of *rottis* made from it and the individual number eaten, for each pregnant woman the nutritive value could be calculated.

Besides food intake, the nutritionists also carried out the anthropometric measurements. In addition to weight gain, nutritional status of women was also estimated by the development of skinfold thickness and anaemia during pregnancy. For the assessment of skinfold thickness, a Harpender calliper was used. Three skinfolds could be studied: those of biceps, triceps, and subscapular. Measurement of the skinfolds of both supra-iliac and thigh was intended, but had to be cancelled. Not only the informants themselves, but the elders also did not agree with measurements on these parts of the body. This was not only related to prudishness. The latter measurement was also associated with a negative effect on the well-being of the fetus. Anaemia (haemoglobin level: Hb) was measured in the field with the help of a BMS Hb-meter. By taking a small drop of blood from the finger (the nutritionists wore plastic gloves and used disposable blood lancets in order to prevent any infection), haemoglobin levels could easily be determined by this colour-comparing method.

The study of prevalence of illnesses consisted mainly of perceived diseases. By asking whether women had been to a doctor or used any medicines we got further information. Some more information was collected on antenatal check-ups, visits by local government nurses, acceptance of iron and folic acid tablets, and tetanus injections.

3.6.2. Pregnancy histories and physical activities

The objective of this part of the quantitative research (questionnaire D, appendix E), was to estimate the intervening variables age, parity, and length of last birth interval. Here, we were able to check the information on age given before in the census. By relating dates on live births and deaths, on stillbirths and abortions, to festivals (see local calendar in appendix D), reliable information on pregnancy histories was gathered. Age of adult women was more difficult to estimate but by relating important events to each other, consistency in data resulted.

Here, three major events in a woman's life —related to each other— turned out to be remembered very well. First, menarche is an indication that a girl is mature and therefore marriageable. Literally, reaching menarche in Kannada means that a girl 'becomes big' (*dodakke*). The event is celebrated in an elaborate way with a special ceremony. Marriage is the second event and is related to maturity. Most women in the sample could remember the number of years or months between menarche and marriage. The third event is the pregnancy and birth of the first child. As the reproductive role of women is most important in this society, the period between marriage and the first child —the proof of fertility— is remembered very well. The importance of these three life events is stressed by the special songs (*soobhana*) sung at each

of them. Their interrelatedness can be shown by the analogy in kind of ceremony, the special kind of food eaten and the cultural meanings attached to them. The assessment of the variables behind marital status (age at marriage and years married) also requires a further specification. Child marriages are quite common in this area. Most of them are conducted between kinsmen, the girls marrying their maternal uncle or cross-cousin. Only after reaching maturity (and even then people wait for some time, see Chapter 5), do women actually live with their husbands. This meant that in the case of a child marriage, we also had to ask when the marriage was consummated.

The last questionnaire for pregnant women focused on activities conducted during pregnancy (questionnaire E, appendix E). This variable is an important one as the amount and kind of activities conducted during pregnancy indicates the energy expended (see Chapter 2). Physical activity was made operational in two different ways. First, all women were asked to indicate the kind and duration of work conducted during pregnancy. In addition, a sample of women, selected according to caste and village, were followed throughout one day in which their daily activities were written down per time unit. These data only give an idea about the daily activities conducted by women during pregnancy and are presented as case studies in Chapter 5. They are not suitable for calculation of energy expenditure, which, however, is beyond the scope of this project.

3.6.3. Measurement of the child

Having followed the women throughout their pregnancy, the children were followed up to one month after delivery. The children were measured at two points in time: immediately after delivery and one month after birth.

We had intended to weigh the children within 24 hours after birth with a Salter spring weighing scale (division of 50 grammes). Those children born in the research villages indeed were weighed on time with this instrument by the assistants. However, as more than 60 per cent of the women went to their parents' place for delivery (see Chapter 5), we had to find another solution for weighing the children. We decided to use kitchen scales (division 25 grammes), adapted by putting a bigger tray on top. We took these scales to the woman's native place and asked a person from the family (someone who could read and write) to weigh the baby within 24 hours. Explaining the procedure, we asked this person to mark the place where the pointer stood still with a non-washable pen. Later on, we were able to read these marks. It turned out to be a good solution; people cooperated in a nice way. For the research team it meant that a lot of travelling had to be done. In addition to the eleven research villages, about eighty to ninety other villages had to be visited.

In this region, another problem inherent to weighing a baby within 24 hours after birth, is the existence of the idea of pollution. A baby is not supposed to be touched within five days after birth. Some women asked the assistants and researcher to come back after five days. However, most of the time this difficulty could be overcome, not least because the assistants themselves were inhabitants of the village and were able to persuade people to participate in the research. Before visiting the mother and child —as is common practice in this region— the assistants had to wash their hands and feet extensively. In most cases, the child was put into the weighing bag by the mother of the wet mother or by another close female family member. The assistants did not actually have to touch the child and could still weigh it. With

regard to the method with the adapted kitchen scales, in which family members measured birth weight, the rule of pollution did not interfere with the research.

For measurement of height and head circumference, however, the child did have to be touched. When the family did not object, we measured these variables together with birth weight. Otherwise, we came back afterwards, when the first five days of pollution were over. It is not very likely that big changes in height and head circumference occur in these five days.

In most studies in developing countries, gestational age of the child has appeared to be quite difficult to estimate. Here, women indicated the date of last period by relating it to new and full moon. Therefore, we believe that the data gathered on gestational age are quite reliable. Missing values were recorded for the few women (N=3) who became pregnant without having a menstruation in between. The method of estimating gestational age by identifying clinical and neurological signs (Dubowitz, 1981; cited by Illingworth, 1987) could not be applied. Again the rule of pollution plays a role, but also the educational background of the assistants was not sufficient to apply this method.

3.7. The fieldwork: interviews

As mentioned before, in order to understand and explain the custom of reducing food intake during the last trimester of pregnancy, small-scale and qualitatively oriented approaches are needed. In our research, methods like participant observation, structured and semi-structured in-depth interviews, and focus group techniques were used. In the last part of this section we discuss the response of pregnant women in the longitudinal study.

3.7.1. Participant observation

Being most important within anthropology, this method has been described and discussed extensively in the literature. Here, we want to focus only on a few issues which turned out to be important during the research.

For participation in a community, first of all knowledge of the local language is required. A first orientation on the local language Kannada was accomplished in The Netherlands. In addition, the researcher followed an intensive daily private course lasting six weeks in Dharwad. During the stay of twenty months more and more active knowledge of the language was achieved.

To collect reliable data on sensitive topics like pregnancy and childbirth above all rapport with the people concerned must be established. In establishing a first contact, besides language outer signs are important. During the whole research period, a local dress was worn, most of the time a *churidar* and for functions and festivals a *saree*. In addition, ornaments such as glass bangles, ankle chains, toe rings —to indicate marital status— appeared to be very helpful to overcome the initial distance between the researcher and informants. Adaptation to the Indian way of life and behaviour took much longer. Looking back, we can say that almost half a year was needed to establish a good rapport with people. One fact seemed to speed up the process: when her husband came to Dharwad, apparently confirming her social status, the researcher suddenly seemed to be more accepted. Also the fact that the research assistants —each with

their own social background— lived in the villages themselves and were kind enough to share part of their life with the researcher, hastened the process of participation. The meals shared with their families (the research assistants and their families took care of food intake of the researcher!), the festivals and marriages attended in their villages and the discussions together contributed a lot to the process of getting acquainted with the social and cultural context. In addition, through the assistants a lot of information on the research topic and on customs like the first pregnancy ceremony (*kubasa*) and the naming ceremony of the child was obtained.

One may wonder to what extent a foreigner can really participate in the native culture. Factors which play a role are sex, age, marital status, appearance of the researcher, foreign status, and the way one is viewed at by the inhabitants. However, besides many drawbacks of being a foreigner and outsider, it sometimes also turned out to be advantageous. Several times, remarks were made that an Indian woman would not be able to conduct this kind of research. Especially the visits after delivery, a period in which the wet mother is supposed to be secluded from the outer world (see Chapter 8), would not be allowed so easily. Attributes of the researcher, like being alone and a woman (both qualities regarded as less threatening), being a student all the way from Holland to study the facts about births (and as one could not expect a white foreigner to know the customs of seclusion after delivery) opened doors which were closed to Indian women.

Observation, the second component of this anthropological method, is a very important instrument. Compared with the survey method, it generates information that is more reliable and detailed. Two examples are presented here. Asking women in the survey whether they breastfed their last child while being pregnant, they replied negatively. Custom dictates that women do not breastfeed a child during pregnancy, as it is supposed to negatively influence the health status of that child. Therefore, women replied they did not breastfeed during pregnancy. However, on observation it became clear that in reality women did feed breastmilk to their youngest child, sometimes even until delivery (see Chapter 5). In the same way, during the survey all women said they took the iron and folic acid tablets given by the local nurse. But during the in-depth interviews, it appeared that hardly any of them had taken the tablets: they were just thrown away. Several other examples, such as those related to actual intake of supplementary feeding or different food patterns between boys and girls, indicated the need for observation.

3.7.2. In-depth interviews

During the whole research period, all questionnaires and interviews were conducted at a moment suitable to the informants. These times differed per season, but the best hours to interview were mainly the early morning and evening.

All women in the study population were interviewed about their ideas on food intake during pregnancy, the course of pregnancy, the influence of important others, etcetera. Questionnaire F was used only as a guideline indicating the subjects to be included in the interview. It certainly does not reflect the way in which questions were posed: the use of scales, in which a respondent indicates on a five-point or three-point scale whether he or she agrees with an assumption, is a very western way of posing questions. In this study, it appeared to be very difficult to ask more abstract questions. For example, when women were asked what would

happen if they ate more during pregnancy, a very common reaction was: "but I did not eat more!".

A group of women (N=32) was studied in-depth. This sample consisted of women from different religious and caste group, different socio-economic status, and different villages. The interviews were conducted by the researcher, the research assistants acting as interpreters. In the beginning, the interviews had to rely completely on the interpretation by the assistants. Later on, as enough knowledge of the local language Kannada had been achieved, the researcher was able to participate in the discussion. During these latter interviews, the commonly known drawbacks of working with interpreters became even more clear. First of all, it is often difficult to get an exact translation of what people say. Sentences are summarized and interpreted by the interpreter. The different native languages formed a problem. To put it in an extreme way, we had to go from local village Kannada to Kannada-English to Dutch-English. One can expect some of the information to be lost or distorted in this process. Furthermore, the way of interpretation differed between the assistants. Therefore, for the researcher knowledge of the local language was one of the most important assets to be acquired.

Permission of the respondents was asked to use a small tape recorder during the interview. Most of them agreed. After having finished the interview, part of the tape was rewound and played again, which sometimes induced hilarious reactions from the side of respondents who heard their own voice for the first time.

A lot of time was reserved for these interviews: time for an introduction, social talk, and of course the inevitable tea with lots of sugar. While conducting these interviews, often other people were present, mostly other women of the family. Given the social hierarchy in this society, it sometimes turned out to be difficult to hear the ideas of the women themselves. Often, mothers and mothers-in-law answered. In those cases, an effort had to be made to reach the women themselves. However, an interview with other women of the household present also gave an idea about the social stratification and decision-making process within the family and the influence of important others. Furthermore, key-informant interviews were conducted among traditional birth attendants (dais), Village Health Workers (VHW), and *anganwadi* teachers.

3.7.3. Focus group

This technique, in which a group of people is selected from a target population for discussion on a certain topic (Knodel *et al.*, 1988), was used only a few times. In this particular kind of research, the technique appeared to produce less and less reliable information compared to the methods of participant observation and in-depth interviews. Some disadvantages of the method were observed. In one of the group discussions one or two women dominated the discussion, while other women remained silent, even though the moderator tried to get their opinion. Also, since women are interviewed outside their own social environment, certain information, which one can achieve during in-depth interviews by observation, is lost. We think that the focus group technique is an excellent method to gather information about a certain topic relatively quickly. However, in order to get more in-depth information, one needs other methods. Knodel *et al.* (1988:45) also conclude

> ".. a full fledged anthropological study or the micro-approach to demographic investigation .. permit far greater in-depth analysis of linkages between demographic behaviour and socio-economic and cultural underpinnings in the context of local communities than is possible with a focus group study".

In our research too, we preferred to observe and interview the women individually, within their own social environment.

3.7.4. Response

During the whole research period, people were quite willing to cooperate. However, sometimes, especially in the nutritional and anthropometric survey, it was difficult to reach all the women and to take all the measurements (see Chapter 6). Early work in the fields, visits to their parents' house to celebrate a festival, sometimes interfered with the research. In the case of the Gouli people, a tribe settled in a small hamlet (see Chapter 4), language turned out to be a problem. Originally coming from Maharashtra, not all of them spoke the local language Kannada.

However, none of the pregnant women selected refused to participate in the longitudinal research. This despite ideas prevalent in the society that some measurements would negatively affect the physical or mental well-being of the woman or the child. The two nutritionists, for example, were sometimes confronted with the fact that their questions about food intake were regarded to have a negative influence. The food was believed to be affected by the evil eye (*kannu*) (see also Chapter 7 and Chapter 8) and would be badly digested, causing feelings of unwell-being. Other women (all three of whom lost their child after delivery) afterwards expressed the feeling that the measurements done in the research had been bad for the child.

Furthermore, we were confronted with questions about remuneration for participation in the research. Not only money, but medicines were also asked for. Money was never given as a reward for information. In some cases, especially for women after delivery, medicines prescribed by doctors were subsidized. At the time of birth, a small present was donated to the child. At the end of the research, we gave all the pregnant women who had participated in the research, a small present, i.e. a small stainless steel plate.

Chapter 4 The research area

In Chapter 3, we discussed how the research area and research villages were selected. In this chapter, we describe the situational, demographic, economic, historical, social, and cultural aspects of the research area. Regarding the first —quantitatively oriented— research question, i.e. what are the effects of a reduction of food intake during the last trimester of pregnancy, we describe the background variables related to food intake, maternal weight gain, and birth weight (see Figure 2.7). Regarding the second —qualitatively oriented— research question, i.e. what are the reasons behind the custom of reduction of nutritional intake, we describe the context in which individual food behaviour during pregnancy takes place (see Figure 2.9). Information presented is mostly derived from our census and from key informant interviews conducted during the fieldwork and is completed with information derived from literature.

We subsequently discuss the situational context (Section 4.1), the demographic context (Section 4.2), the historical context (Section 4.3), the economic context (Section 4.4), and the cultural (Section 4.5) and social context (Section 4.6). This division, however, is not mutually exclusive. In the Indian situation, economic, social, and cultural factors are closely related to each other. In the more traditional villages, a person who by birth belongs to a certain caste, lives in a certain area of the village and most often adheres to the occupation related to his caste.

4.1. The situational context

In this section, we discuss the location of the research area and its ecological features. Subsequently we examine the settlement pattern and facilities available in the villages. As our topic of research is concerned with the health condition of mothers and children, we discuss the health services available in the research villages more extensively in Subsection 4.1.4.

4.1.1. Location of the research area

The research area is located in Dharwad *taluk*, Dharwad District in the South Indian state of Karnataka (see Figure 4.1). Karnataka is on the Arabian Sea and is surrounded by the states of Goa to the west, Maharashtra to the north, Andhra Pradesh to the east, Tamil Nadu to the south-east, and Kerala to the south. Politically, the state has only existed since 1956, when it was made up of the former Princely State of Mysore, Madras, and Bombay Presidency (including the Dharwad District) and the states of Hyderabad and Coorg. This newly formed state of New Mysore collected all Kannada speaking people. It was renamed Karnataka in 1973 (Kamath, 1982a, pp. 6-10). The state of Karnataka is subdivided into nineteen districts, one of them is the Dharwad District (see Figure 4.2).

Figure 4.1. Location of the state of Karnataka in India

The publication of this map does not imply the expression of any opinion whatsoever on the part of the author concerning the legal status of any country, territory, city, or area or of its delineation of its frontiers or boundaries.

Source: Derived from UNICEF, 1991.

Figure 4.2. Location of Dharwad District in the state of Karnataka, India

Derived from Das, 1984.

Ecologically, the district is divided into three regions: the *malnad*, semi-*malnad*, and the northern *maidan*. A belt of 20-30 kilometres, situated in the western part of the district, is categorized as *malnad* region. It is characterized by a rugged landscape with a number of hills at higher elevation, is forested and receives a moderate to heavy rainfall. The transition zone of semi-*malnad* gradually develops to the east, as both rainfall and vegetation decrease. The *maidan* in the east is a plateau landscape: a huge plain with some isolated hills. This region receives less rain and is extensively cultivated with crops different from those grown in the other areas (Das, 1984, p. 11) (see also Subsection 4.4.1).

Administratively, districts are divided into the lower units of *taluks*. The Dharwad District consists of seventeen *taluks*. Dharwad *taluk*, in which the district town Dharwad and the research villages are located, is situated in the north-western part of the district. Ecologically, the town with surroundings to the west is located in the transition zone of semi-*malnad*. The *maidan* starts only a few kilometres to the east of the city.

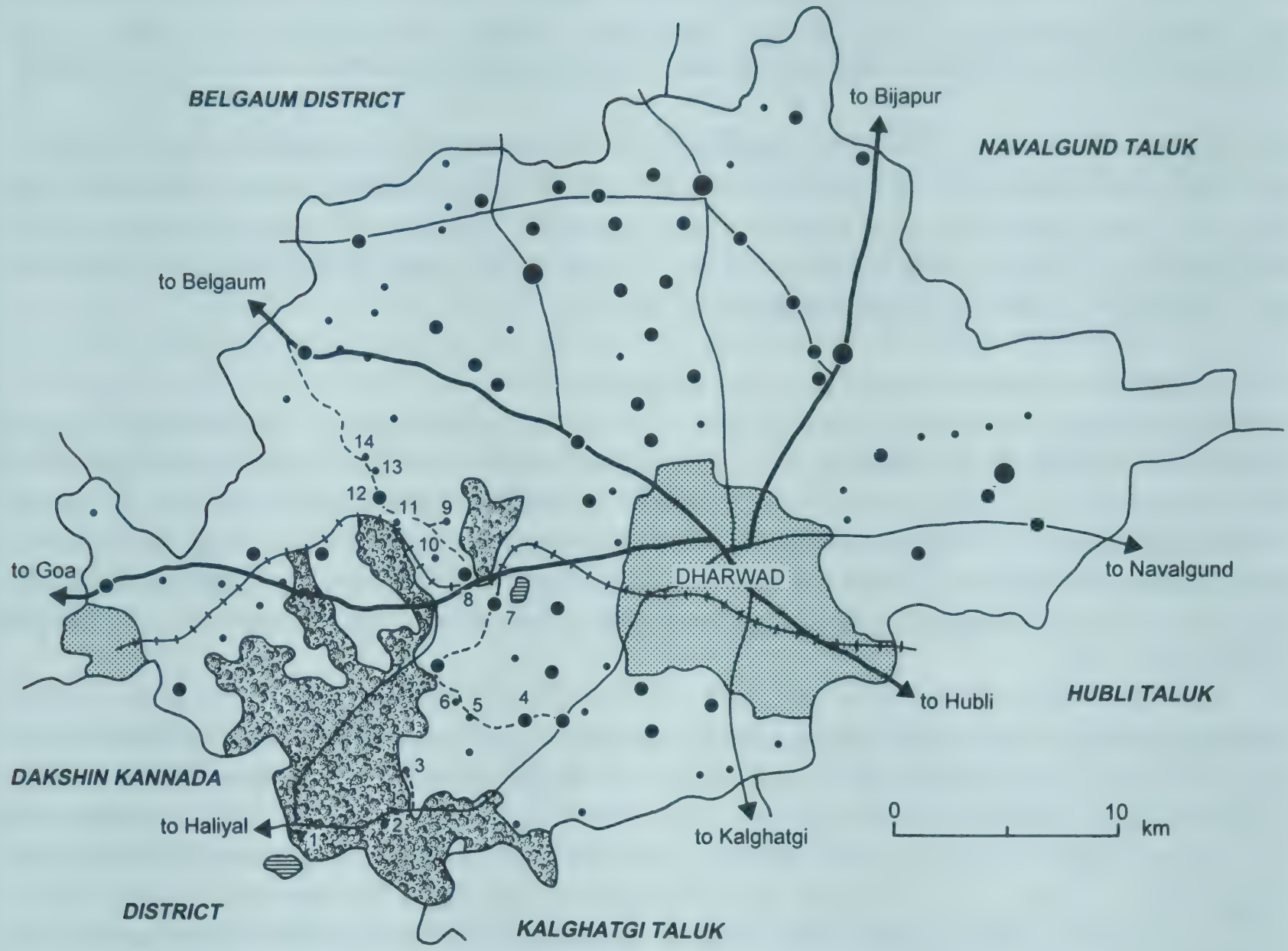
Besides the administrative division into state, district, and *taluk*, a local administration based on the traditional *panchayat*, the village council, exists. In Karnataka this three tier system consists of the Village *Panchayat*, the Taluk Boards, and the District Development Councils (Kamath, 1982b, p. 464). A village *panchayat* covers a village or a group of villages with a population of not less than 1,500 and not more than 10,000 people. The *panchayat* consists of representatives, "not less than eleven and not more than nineteen members elected directly through multi-member constituencies .... for a period of five years" (Kamath, 1982b, p. 464).

Some of the seats in the *panchayat* are reserved for scheduled tribe or caste. Also, there should be at least two female representatives. The functions of the village *panchayat* are twofold: obligatory and discretional. The former includes the maintenance and care of roads, water tanks, street lighting, and sanitation. The second consists of a wide variety of works such as medical relief and keeping statistics. Data on births and deaths in the village, for example, are kept by the accountant of the village *panchayat*. The main source of *panchayat* income consists of 30 per cent land revenues collected in the village (Kamath, 1982b, p. 465).

4.1.2. Location of the research villages

The research villages are all located in the western part of Dharwad *taluk* (see Figure 4.3) in the semi-*malnad* area. However, the villages in the southern part of the area, i.e. Holtikoti, Mavinkoppa, and the former's neighbourhood Tanda Ramachandran, are located in a more densely vegetated region. These villages are situated in a forest reserve area which means that, under the Central Forest Conservation Act, in this region no forest land can be released for non-forestry purpose (Kamath, 1982a, p. 130). The villages Devageri, Lalgatti, and Devarhubli are located just outside the forest area. Devarhubli is only twelve kilometres away from Dharwad, three kilometres from the so-called *pucca* (= paved) road. The other two villages are much smaller and more remote: they can be reached by a *kachcha* (= mud) road only. Mugad is the largest village, situated ten kilometres from Dharwad on a paved road. The village is obviously more urbanized than the others.

Figure 4.3. Location of the research villages in Dharwad taluk



Derived from Das, 1984.

Its neighbourhood Mugad Station, consisting of a few houses located near the station, is located three kilometres away from the village, near the village of Mandihal. This latter village is located near the state highway to Goa. Nagalavi is divided into three neighbourhoods, each located two kilometres from each other on a mud road: Warava Nagalavi, Station Nagalavi, and Goutan Nagalavi. In this cluster of villages, a high proportion of the inhabitants conduct daily work in the nearby stone quarries. Station Nagalavi, as the name indicates, is located near the railway station. Trains between Hubli and Goa pass through the small village which displays a huge installation of solar collectors, their energy being used for the railway system.

The villages of Ramapur, Veerapur, and Kallapur are more remote. Compared with the others, not only is the distance to the nearest town greater, getting there is also more difficult. One can reach the villages either by mud road and crossing a stream or by a roundabout route via the highway to Belgaum and again a mud road. At the peak of the rainy season, these villages are relatively isolated as buses cannot reach them.

4.1.3. Settlement structure and facilities available

The older villages Devarhubli and Mugad exhibit the settlement structure of traditional Indian villages. Travelling to Devarhubli, after having left the paved road and driving on the three kilometre long mud road to the village, one first passes the *matha* (temple) where the *swami* —a Lingayat priest— resides. Driving on, one enters an open space where, under the big tree, people sit and talk, and wait for the buses which bring them to Dharwad. Entering the main part of the village, a huge decorated stone marking a kind of wall catches the eye: Devarhubli used to be a fort.

The composition of the village is traditional: certain groups of people are represented in certain areas. A concentric pattern can be discerned: the higher caste groups located in the middle of the village, the lower at the outside. The Brahmins reside in their colony near the old Ranganath temple. Lingayats and Maratha and a few people from other castes dwell in the neighbouring streets. Here, also the three families of carpenters live nextdoor to each other. In the adjacent neighbourhood, a few potters (Kumbar) live, their houses full of pots, tiles, and other earthenware. A Muslim colony is situated nearby. The Harijans inhabit their own street (Harijan *oni*) near the entrance. Unlike other Indian villages (see for example Epstein, 1962 and Mandelbaum, 1970), in this area Harijans are not separated from the village but reside in their own street within the village. A proportion of the villagers live outside the fort in Janata plot houses: houses built for the poor people under a special government scheme. A variety of castes live here: Lingayat, Maratha, Muslim, Harijan, Walmiki, and a Brahmin family (conducting social work in the village) as well.

The same traditional pattern, although on a larger scale, can be observed in Mugad where the Jains live in their colony at the top of the hill, the fishermen in the Bovi *oni* near the water tank, the basketmakers (Mahar) in another street together with the potters.

The other villages are smaller, more recent settlements and usually consist of only a couple of streets. Goutan Nagalavi, for example, is only one street and is constructed for the settlement of people working in the stone quarries. The hamlet consists mainly of one caste group, the Vodda.

Most of the houses in the villages nowadays are built of mud and stone, the roof consisting of tiles. Only a few houses still have thatched walls and roofs. The traditional house is built as follows. Outside at the front of the house, there is a verandah. It is usually divided into two by the door, which in the older houses is beautifully carved. In some cases, a small room (or two) is attached to the verandah. In the verandah, people sit and talk while chewing their betelleaf (*yeele*) with arecanut (*adike*) and lime (*sunna*).

The main room of the house is usually divided: the people live in one part, the cattle, which stay inside the house at night, in the other. A huge 'basket', made of bamboo mats, stores the paddy harvested the year before. When more than one household resides in a house (see Subsection 4.6.3), each household lives on its own plateau using its own adjacent kitchen.

The average number of people per household is 5.7 (see also Subsection 4.2.2). In Devageri, the maximum number of persons living in one house was found to be 34. The head of the household, interviewed by the research assistant, indeed had difficulty remembering all the names of the children present in the household.

Besides houses, the villages have hotels (places where one can drink tea and eat some snacks), flour mills, and small grocery shops (*kirani*) where sugar, tea, sweets, and bananas can be bought. For general shopping, however, people are dependent on the weekly market days in the nearby towns, like on Tuesdays in Dharwad, when buses from the villages are over-crowded.

Other physical features in the villages are the temples dedicated to different Gods and Goddesses, each requiring prayers on a special day of the week. In the big Hanuman temple in Mavinkoppa prayers are conducted on Saturdays and in the Madavali Ishwara temple in Veerapur people worship Shiva on Mondays. In the abundant temples dedicated to Durgavva or Dyamavva, women worship on Tuesdays and Fridays (see also Subsection 4.5.1).

All villages have either an *anganwadi* or *balwadi* (kindergarten) for preschool children. The *anganwadi* is managed by the government and has other functions besides education, which are discussed in detail in Subsection 4.1.4. The *balwadi* is privately owned. An example is the *balwadi* recently started by the Sidi organization in Mavinkoppa. In all villages also at least primary schooling from first to third standard is available. For higher education, children have to visit nearby villages. Mugad and Ramapur are most developed in educational facilities: both have a high school with classes up to the 10^{th} standard (secondary school: SSLC). In addition, the rural development organization IDS arranges night-schools, where children who have to work during the day time (for example herding sheep and goats) learn to write and read. Classes are also organized for women. Other organizations focusing on improvement of the status of women are the Mahila Mandals, in which groups of women come together and discuss possibilities to improve their lives. Some of these women's groups have special saving schedules: women contribute some rupees each month and from time to time certain items, like a sewing machine, can be bought.

All but one of the villages (Goutan Nagalavi) are supplied with electricity. However, only 38.9 per cent of all households actually have electricity in their houses. All villages have either borewells or public taps for the water supply.

Having discussed these facilities available in the villages, health facilities like Primary Health Care and the *anganwadi* are described separately in the next subsection.

4.1.4. Health facilities available

In Karnataka, national primary health units, managed by the central government, serve a population of 80,000 to 120,000 people. In addition, primary health units managed by the state serve a population of 10,000-15,000 people (Kamath, 1982a, p. 696). In the research area, such a Primary Health Centre is located in the village of Mugad. This centre is managed by a medical doctor and a nurse who can be consulted daily by the villagers. A new building was constructed for the provision of this primary care only in 1992. Rooms meant for hospitalization of patients were built, but no means were left to supply the necessary equipment, leaving the building almost empty. Most people in the villages are therefore dependent on either Dharwad or another nearby city (like Haliyal or Alnavar) for health services supplied in health centres and hospitals, or on weekly visits by private doctors travelling from village to village.

For mother and child care, the female village health visitors (called the local nurses by the villagers) play an important role. These local nurses are affiliated with the Ministry of Health and Family Welfare, whose district office is situated in Dharwad town. One nurse covers a certain number of people and in this way is responsible for mother and child health services in one or more villages. In the research area, some of these nurses live in Dharwad and travel daily to the villages while others, like in Mugad and Ramapur, live in the villages themselves. They take care of antenatal check-ups of pregnant women, distribution of iron and folic-acid tablets, immunization of both mother and child, education on health and nutrition, and referrals to hospitals. In immunization campaigns aimed at children, local nurses from different villages work together. Also, the nurses create awareness with regard to family planning and each of them has to reach a target of sterilizations. More recently, they also create awareness regarding spacing methods. The oral pill, for example, if available, is provided to women who are interested. A characteristic of the oral pill, worth mentioning here as it is related to taking iron tablets during pregnancy (see Chapter 5), is that one strip contains twenty eight tablets: twenty one contraceptives and seven iron tablets. The latter should be taken during the period of menstruation.

In addition, mother and child health care is provided by the *anganwadi* which is part of the Integrated Child Development Services (ICDS). The ICDS, started in 1975 by the Ministry of Social Welfare, is a national programme focusing on improvement of mother and child health by integrating nutritional care with non-formal education. The programme contains a supplementary feeding programme, immunization, health check-ups, referral services, nutrition and health education, and non-formal education aimed at both pre-school children, and pregnant and lactating woman as well (Nayana and Ramkumar, 1988, p. 2). The programme submits its activities through the *anganwadi* where a teacher, selected from the village, works together with a helper. Children in the age group of 0-6 years old can visit the *anganwadi* six days a week. They receive some basic education and receive supplementary feeding, a *tiffin*

(a snack) prepared from CBS flour with oil, pulses, chillis, onions, jaggery, and some spices. In addition, the children are weighed every month, their weight being recorded in a growth curve kept at the *anganwadi*.

The teachers too register the pregnant women in the village, from month five of pregnancy onwards. Especially in the smaller villages, however, where people know each other and live closely together, the fact that a woman is pregnant will be known earlier. Names, parity, month of pregnancy, and date of birth of the child are recorded. The information gathered is used to identify women at risk who need supplementary feeding (see Chapter 5).

In reality there are huge differences in how the *anganwadis* in the different villages function. Some teachers indeed weigh the children every month and keep records on growth, while others work in a far less systematic way.

Furthermore, the development organization IDS (see Chapter 3) trained Village Health Workers (VHW) in basic health care. The VHWs have a basic health kit containing simple medicines against common diseases like diarrhoea or coughing. Every day, these VHWs pay visits to members of the identified target population. For major problems, the VHWs refer to a hospital or health centre.

In addition to the formal health sector, traditional health services are prevalent in the research area. There is a homeopathic doctor in Kallapur, and a religious traditional healer in Mugad. In addition, villagers visit traditional healers in other villages. Examples of these traditional services are discussed in detail in the Chapters 7 and 8. Furthermore, services provided by traditional birth attendants, the *dais*, are discussed in Chapter 8, which deals with deliveries.

4.2. The demographic context

In this section, the demographic indicators for the state of Karnataka, the Dharwad District and the Dharwad Taluk are presented and compared with national figures. In addition, demographic indicators derived from the census conducted in the research villages are presented.

4.2.1. Demographic indicators for state, district, and taluk

The state of Karnataka has 44,817,398 inhabitants, 5.3 per cent of India's total population. The Dharwad District counts 3,498,814 inhabitants while in Dharwad *taluk* 207,138 people were registered in the census of 1991. However, this latter figure does not include Dharwad town. The population of the twin cities Dharwad and Hubli, only the first of which is situated in Dharwad *taluk*, is estimated to be 647,718 people. Hubli, the industrial and commercial centre, accounts for approximately three quarters of this population. Dharwad, the educational centre, for one quarter.

Table 4.1 depicts different demographic indicators for India and Karnataka and lower administrative levels of district and *taluk* as well. Compared with the national figures, Karnataka has lower Crude Birth Rates (CBR) and Crude Death Rates (CDR) (except in the urban areas where rates are exactly the same) and a lower decadal growth rate in the period 1981-1991.

Table 4.1. Demographic indicators for India, the state Karnataka, the Dharwad District, and the Dharwad taluk

	Dharwad *taluk***	Dharwad district	Karnataka	India
Total population	207,138	3,498,814	44,817,398	843,930,861
Population growth rate (%)				
1971-1981	25.76	25.90	26.75	24.66
1981-1991		18.79	20.66	23.50
Crude Birth Rate				
(per 1,000 pop.) combined			27.9*	30.5*
rural			28.9*	32.0*
urban			25.0*	25.0*
Crude Death Rate				
(per 1,000 pop.) combined			8.7*	10.2*
rural			9.5*	11.1*
urban			6.5*	7.1*
Sex ratio (females				
per 1,000 males)				
1981	960	948	963	934
1991	948	945	961	929
Infant mortality				
(/ 1,000 live births) combined			80*	90*
rural			89*	98*
urban			53*	58*
Literacy rate (%) combined	31.2	48.8	56.0	52.1
male	49.4	59.4	67.3	63.9
female	27.1	37.5	44.3	39.4

* provisional data 1989: Office of Registrar General.
** excluding Dharwad town.
Source: Census 1991 (Bose, 1991; Premi, 1991; Nambisan, 1991).

The Infant Mortality Rate (IMR) in the rural areas of Karnataka amounts to 89 per 1,000 live births. In the census of 1991, Karnataka was one of the states showing a decline in sex ratio during the last decade, from 963 to 961 females per 1,000 males. However, compared with the national ratio of 929 females per 1,000 males, this figure is relatively high. Literacy rates for Karnataka are higher, among both men and women, than those at the national level.

At the district level, the decadal growth rate between 1981 and 1991 was lower (18.8 per cent) than average growth at state level (20.7 per cent). Compared with the period 1971 to 1981, exhibiting a growth rate of 25.9 per cent, population growth in the last decade declined considerably. The sex ratio in the district shows the same declining trend as at the state level, from 948 to 945 females per 1,000 males. In Dharwad *taluk*, the sex ratio in 1991 was considerably lower than in 1981: 948 and 960 females per 1,000 males respectively. And as for the literacy, the low percentage (especially for women) at *taluk* level is significant: in 1991, only 27.1 per cent of the women were literate.

4.2.2. Demographic indicators for the research area

From the census conducted in the research villages, the following demographic indicators are derived (see Table 4.2). The total population of all villages together numbers 11,621 people who live in 2,040 households. The average number of people in one household is thus 5.7. Data on the number of people in the different research villages are presented in table 4.3.

The age distribution of the research population, adjusted for age heaping, is presented in Table 4.4 and Figure 4.3 (derived from De Boer, 1993). The age group under 15 years comprises 37.3 per cent of the total population. The sex ratio of the total population amounts to 922 females to 1,000 males. Compared with the ratio for Dharwad District (945 females per 1,000 males), the sex ratio is quite low, even lower than the national figure. In the age groups of 30-34 and 35-39 years, the proportion of females is very low, i.e. 825 and 783 per 1,000 males respectively.

Table 4.2. Demographic indicators for the research area

	Research area
Total population	11,621
Crude Birth Rate (births per 1,000 population) in 1990	36.7
Crude Death Rate (deaths per 1,000 population) in 1990	6.5
Sex ratio (females per 1,000 males)	922
Educational level: no education (%)	
combined	51.7
males	42.3
females	62.0
Age at marriage (years)	
males	22.7
females	14.8

Table 4.3. Total population, number of households, and average number of people per household, per village

	Total population	Number of households	Average number of persons per household
Village			
Mugad	3,911	707	5.5
Mandihal	1,037	193	5.4
Warava Nagalavi	355	67	5.3
Station Nagalavi	136	26	5.2
Goutan Nagalavi	110	20	5.5
Ramapur	1,121	174	6.4
Veerapur	695	122	5.7
Kallapur	765	123	6.2
Devarhubli	1,659	300	5.5
Lalgatti	305	56	5.5
Devageri	465	67	6.9
Holtikoti	580	105	5.5
T.Ramachandran	138	22	6.3
Mavinkoppa	344	58	5.9
Total	11,621	2,040	5.7

The CBR in the villages is estimated to be 36.7 births per 1,000 population (over 1990). A rate higher than the one at state level. The CDR is lower at 6.5 deaths per 1,000 population in 1990.

From asking people about their highest level of education (see Chapter 3), we learnt that the percentage of the total population who are illiterate, i.e. who have not received any education at all, is 51.7. For women and men these percentages are 62 and 42, respectively.

The average age at marriage for men and women in Karnataka has been estimated to be 25.9 and 19.2 years respectively in 1981 (Government of India, 1992). However, this figure seems quite high and seems to reflect the fact that by law girls are allowed to get married at the age of 18 years only. From the data in the census, an average age at marriage of 14.8 years was found. Men in the area marry at a higher age, on average 22.7 years old. These averages, however, include child marriages which are consummated only after the girl has reached maturity. The averages calculated from the data collected in the census therefore might be too low and do not estimate age at consummation of marriage. For the study population of pregnant women, more detailed information was gathered, resulting in an average age at consummation of marriage of 15.7 years old (see Chapter 5).

*Table 4.4. Age distribution of the population, men and women**

Age groups	Women	Men	Sex ratio (women per 1,000 men)
0- 4 years	760	770	987
5- 9	700	739	947
10-14	647	713	907
15-19	595	635	937
20-24	555	579	958
25-29	500	539	927
30-35	402	487	825
36-39	312	398	783
40-44	250	297	841
45-49	205	219	936
50-54	171	171	1,000
54-59	148	147	1,006
60-64	126	131	961
65-69	92	101	910
70+	45	56	803

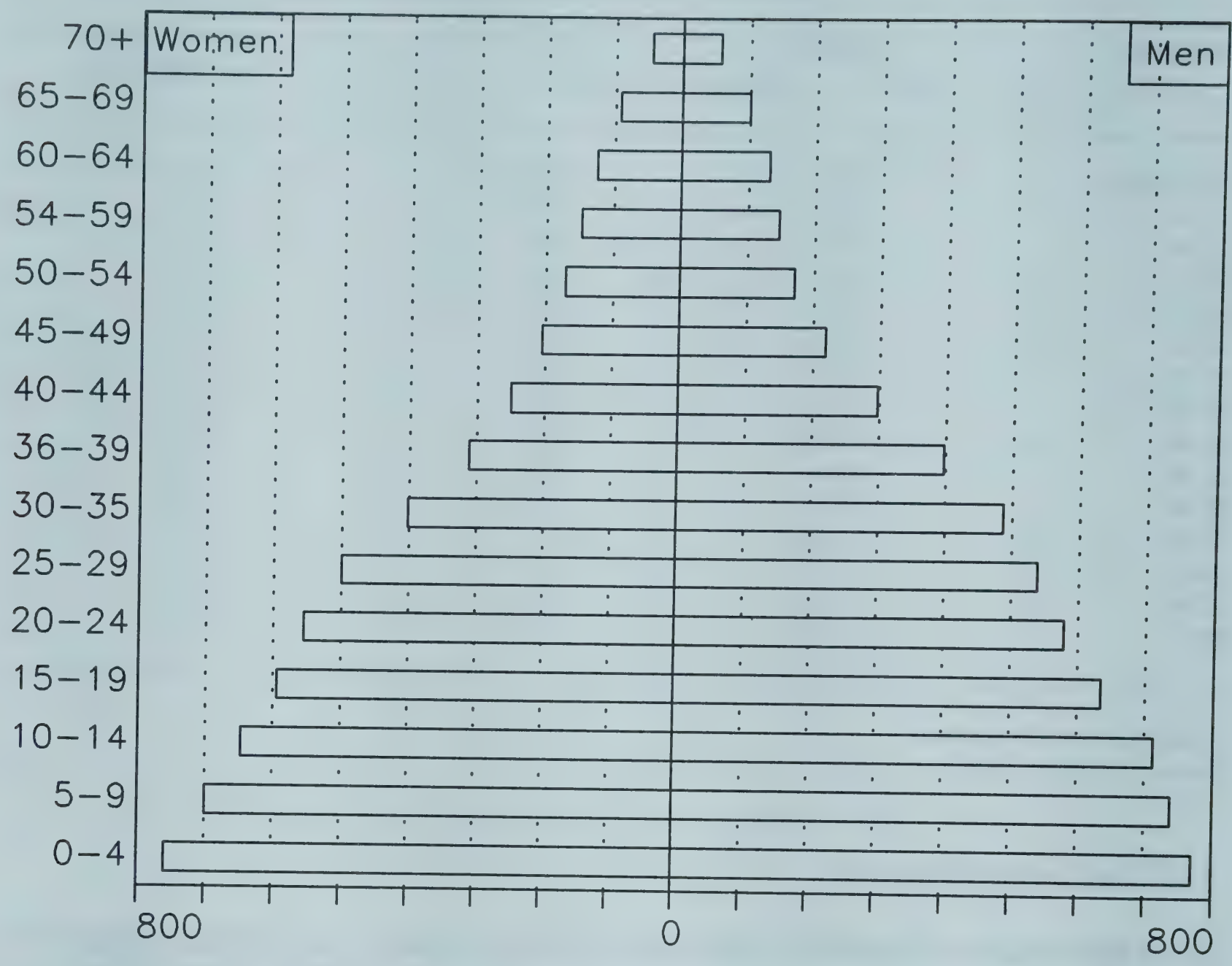
* Adjusted for age heaping.
Source: De Boer, 1993.

4.3. The historical context

In the first section we mentioned that the settlement structure of the villages varies and is related to differences in historical background. Mugad and Devarhubli are beyond doubt the oldest villages. In ancient times Mugad was the headquarters of thirty villages and was known as Mugunda. The oldest inscription found in the village is dated 1045 A.D. and belongs to the Chalukya king Someshvara. This period in the Kalyana Chalukya empire, lasting from the end of the 10th to the end of the 12th century, was a prosperous time for Karnataka (Kamath, 1982a, p. 253). The inscription found in Mugad describes grants given to a Jain temple and mentions a certain Jain school which was highly influential in those days (Das, 1984, p. 21). Jains still play an important role in this village, as is shown in Section 4.6.

Villages like Nagalavi, Ramapur, Kallapur, and Veerapur were established in the last century. Formerly, this area was thickly forested but it gradually became more and more deforested due to the extensive use of trees for fuelwood. In the latter three villages, the fact that the Dharwad District formerly belonged to the Bombay Presidency is reflected in the overall presence of the Maratha caste (originally coming from Maharashtra, the state in which Bombay is located). The name Veerapur came into being in the following way. The first inhabitants of the villages kept goats. And one night, a cheetah came and killed some of the animals. Hearing the noise, the people came out of their houses, fought the cheetah and succeeded in killing it. Since then, the place has been called Veerapur: the word *veera* meaning courageous and *pur* meaning locality.

*Figure 4.4. Age distribution of the population**



* Adjusted for age heaping.
Source: De Boer, 1993.

Another example of an older settlement is Holtikoti, although the village as it is today has existed only since 1951. This village has a particular history which was narrated to us by the retired Brahmin village headmaster. Formerly Holtikoti was recorded as Hanakooti, *hana* meaning wealth and *koote* meaning a town surrounded by a wall, a fort. The village was governed by a ruler named Naganagowda, whose brother was married to a beautiful woman. Naganagowda fell in love with his brother's wife. One day, on her way to the temple dedicated to the snake god in order to perform a *puja* (worship), Naganagowda saw her walking and followed her. There, he grabbed her hand. In local language this means that he propositioned her to sleep with him (Srinivasan, 1976, p. 41). The woman —feeling harassed— conducted her *puja* and prayers to the snake god. The snake, a cobra, heard her prayers, and came and bit Naganagowda. He fell down and she went home. The next morning a lady sweeper (*hoolati*: literally meaning a lower caste woman) came to the snake temple and there she discovered the ruler lying on the ground. On seeing his dead body, she prayed to the snake

god. And ... hearing her prayers, the cobra came and took the poison out. Naganagowda woke up, alive and safe. On seeing the lady sweeper, the ruler thanked her saying:

> "I will name the fort after you. Instead of Hanakooti it will be Holati kooti from now onwards".

The story continues: Naganagowda asked the lady sweeper to seek a boon. And she said:

> "let no one here die of a snake bite".

Since that time, as the story goes, anyone who is bitten by a snake is kept inside the temple with the doors closed. The family members conduct a *puja* to the snake, and the cobra comes and takes the poison out.

This story of Naganagowda happened a long time ago, the old teacher told us, in the 19th century. Besides the interesting narration itself, the story reveals some of the social relationships in Indian society, like the one between a man and the wife of his brother.

In the forties, in the present century, an epidemic of cholera hit the village of Holtikoti. Many people died and many others migrated to nearby villages. Only a few families decided to stay. In 1950, a huge fire destroyed the whole village except the snake temple. The few families who still resided in the village built a new village in 1951, about two kilometres to the south. Slowly more and more families came back and new ones settled, making up the village now known as Holtikoti. The snake temple which played such an important part in the history of the village, is located in the old village. The inhabitants of Holtikoti still go there to worship, walking two kilometres through the fields to reach the temple.

The other villages are recent settlements and consist predominantly of one caste group. Goutan Nagalavi for example is a settlement of people working in the stone quarries and most people belong to the Vodda caste, traditionally related to the occupation of stonecutting. Another example is Tanda Ramachandran, the hamlet with one row of fifteen houses situated along the roadside, which consists of one tribal community, the Gouli. The Gouli are semi-nomads: during the summer men wander around with their cattle. Traditionally, their huts are built from wood and sticks and are located in the dense forests. However, the forest area now falls under the reservation act and the Gouli have been rehabilitated in places outside the forest. The inhabitants of Tanda Ramachandran came from two or three different dwellings in the surrounding forest area and settled down, some twelve to thirteen years ago, in this small hamlet. Their permanent houses are built with the help of the government.

4.4. The economic context

In the census, data on primary source of income of all households was gathered (see Table 4.5). The most important source of income consists of agriculture (57.3 per cent) which includes cultivation of land owned by the household only.

Table 4.5. Primary source of income for all households

Primary source:		N
Cultivation own land		1,173
Wage labour, any		573
Artisans:	carpenter	33
	blacksmith	10
	potter	14
	basket maker	6
Traditional services:	priest	3
	barber	7
	washerman	1
Other caste related work:	stonecrushing / building industry	20
	fishing	30
	leather work	9
Merchandise		29
Modern services		96
Tailoring		11
Other		18
Unknown		7
		2,040

Coolie work, or wage labour, includes agricultural labour (like weeding the fields of others, and cutting paddy), but also work on the nursery of the Forest Department in Holtikoti or the making of leafplates. It implies dependency of the household on daily wages. On average, a woman earns 10 rupees (about 60 cents) only per day, men about 12 to 15 rupees a day. The other primary sources of income mentioned in Table 4.5, are partly traditional occupations related to caste group but also more modern oriented occupations like services. The latter group includes people working in government jobs like teachers, nurses, and railway employees, but also workers in development services. In this section, we first focus on agricultural activities and then discuss the other activities, especially those related to caste group. This latter subject anticipates on Section 4.5 which deals with the cultural and social context.

4.4.1. Agricultural activities

In the villages, land is an important socio-economic asset. Ownership of land implies regular food supplies for the household, an income (if crops are sold), and the possibility to exchange paddy for wage labour or artisanal work like carpentry. Land is a hereditary asset: land of the father is divided between his sons. In the whole area, 61.9 per cent of all households holds land, i.e. cultivates either own land or land which is leased in. Table 4.6 indicates the differences between the villages. The villages of Ramapur and Devarhubli have the highest percentage of households engaged in agriculture.

Table 4.6. Number and percentage of households holding land, per village

Village	N	% households holding land
Mugad	707	53.6
Mandihal	193	55.4
Warava Nagalavi	67	35.8
Station Nagalavi	26	26.9
Goutan Nagalavi	20	20.0
Ramapur	174	83.3
Veerapur	122	61.5
Kallapur	123	73.0
Devarhubli	300	80.3
Lalgatti	56	52.7
Devageri	67	67.2
Holtikoti	105	62.9
T. Ramachandran	22	59.2
Mavinkoppa	58	63.8
Total	2,040	61.9

Most of the farming in the area is dry farming. The census revealed that only 11.8 per cent of all cultivated land is irrigated. Those who cultivate wet land can produce more crops per year and are also able to cultivate cash crops like sugar cane and bananas. The overall system of dry farming indicates the farmer's dependency on rainfall throughout the year.

There are four seasons in this region. Summer starts around the second half of February with the temperature suddenly increasing from one day to the next and reaching a maximum of 38 degrees Celsius at the end of May. In the summer months of April and May, heavy thunderstorms occur in the evenings. The south west monsoon starts in the beginning of June and lasts until September. In the rainy season, extensive showers and thunderstorms interchange with drizzling rain (each type of rain has its own name). The roads in the villages are muddy and the whole atmosphere is damp. October/November is the post monsoon period and in December the winter season, a period of relative coldness, especially at night.

The agricultural cycle is related to these seasons and starts after the summer months. In this hot season, there is not much work to be done in the fields and people have time for other activities like weddings and (re)building of houses. After this, men start to prepare and plough the fields, and sow the crops.

The most important food crop cultivated in this semi-*malnad* region (see Section 4.1) is paddy (dry and wet), while jowar and wheat are minor crops. In addition, pulses such as horse gram and green gram, vegetables like tomatoes, brinjal, cucumber, and leafy vegetables, and spices like mustard, sesamum and chillis are grown. The main cash crop is cotton. Sugar cane and bananas are grown on a few plantations. The crops are different from those cultivated in the

maidan area (which starts just a few kilometres to the east of Dharwad town) where people cultivate more crops like potato, peanut, and maize.

In the rainy season, everyone and everything is focused on agriculture. Traditionally, farmers base their pattern of cultivation on the amount of rainfall expected in a certain *Nakshatra*. The Hindu calendar, starting with Ugadi in March, is divided into twenty seven periods, the *Nakshatras*, each lasting approximately thirteen to fourteen days (Epstein, 1962, p. 10; Kamath, 1982a, p. 69). In the *panchanga* (the astrological year book released at Ugadi and valid for the coming year for a certain region) information about which period and which time is most suitable and most auspicious for sowing or harvesting is published (see also Srinivasan, 1976, pp. 431-443).

Much agricultural work has to be done during the rainy season and farmers are highly dependent on wage labourers who weed and cut the paddy. During this season, the dry ground slowly changes into a green sea of paddy plants. Vegetables are grown and are abundant in the rainy season. In October, the season of harvesting the paddy starts. The paddy is cut and stored in the fields. In this period the harvest festival of *Seegi Hunnime* takes place. During the festival each family has a get-together in the fields, the women carrying painted baskets full of food on their heads. A *puja* is performed and a feast enjoyed together in the fields. From November/December onwards, the cotton is picked. In the same period, the harvested paddy stored in the fields is brought to the houses.

Animals are major economic assets. Bullocks have a significant role for every farmer who owns land. A pair of bullocks is used for ploughing, for transporting goods in bullock carts, and for threshing paddy. The value attached to the animals is reflected too by the special resting day for bullocks: on Mondays they do not work. This custom is related to the fact that bullocks are identified with Nandi, the bull on which Shiva rides (Srinivasan, 1976). Monday, being the day for worship of Shiva, bullocks are not used for work.

She-buffaloes and cows are kept for milk. Most of the milk is sold to the dairy cooperation and forms an important addition to the income of a household. Only a small amount is left for home consumption. The milk of the buffaloes of the Gouli in Tanda Ramachandran is first cooked in the village and then sent to Dharwad for preparation of special sweets.

In the morning, the cattle leave the houses, usually herded by young boys who graze them the whole day. At sunset, when orange light is shed on the landscape, the animals return home, each of them recognizing its own house and walking into it. A small number of people keep sheep and goats.

4.4.2. Other economic activities

Wage labour not only consists of agricultural wage labour, which is especially needed during the harvest season, but also of other economic activities. In Tanda Ramachandran, Gouli women work as wage labourers in the nursery of the Forest Department in Holtikoti. In Mandihal and Goutan Nagalavi, people are engaged in work in the nearby stone quarries. Not only people belonging to the caste are associated with stone cutting (Vodda) but also others conduct this kind of work. Men cut the stones, and women and children carry them in a basket

on their head to the crushing machine. Other people, especially those living in the forest area, make leafplates. Leaves of a special tree are gathered in the months of March and April. They are used for preparation immediately or dried first. About seven leaves, pinned together with small bamboo shoots, form a plate. These plates, which are especially used for meals during the wedding season or religious functions, are sold to a middleman for about five rupees per 100 leafplates.

Traditionally, caste groups are associated with a specific occupation. However, nowadays this association has become weaker. Most of the carpenters and blacksmiths, both belonging to the Panchal caste, are still engaged in making the tools for farmers in the villages. As in other occupations, remuneration does not necessarily imply payment in cash. The carpenters make tools for a group of farmers, as defined per contract, and every year they receive a certain amount of paddy. However, a quarter of the Panchal caste group nowadays is primarily engaged in agriculture.

Seven of the fourteen potter (Kumbar) households are still primarily engaged in making pots and tiles. They collect clay from the rivers or tanks and transport it home. The potters use a huge wheel, turn it around with the help of a stick, and turn out the pots from a hunk of clay. The pots are kept inside the house to dry and baked later on. The potters also make the typical tiles seen on the roofs of houses in Devarhubli. The Kurbar are traditionally the shepherds and blanket weavers. In other areas in the district they still perform this work, but in the research area most of them are engaged in agriculture. The Uppar, traditionally the manufacturers of salt, or tank and earth diggers, too are primarily engaged in agriculture.

In some of the villages there is still a *dhobi* (Madiwalar), a washerman. Traditionally, the *dhobi* washes the clothes, especially the menstrual cloths. Only one Madiwalar family in the area continues this traditional occupation while the rest is involved in agriculture. Of the seven households primarily engaged in haircutting and shaving (the barbers), three belong to the caste group of Hadpad, one to Maratha and three to Lingayat.

Most Bovi in Mugad are engaged in fishing (22 households out of 28): they either catch fish, which is sold to a middleman and brought to the market, or repair fish nets. Some of the Voddas, traditionally the stone cutters, are still involved in this activity while others (30 per cent) cultivate their own lands. The Mahar, commonly considered as a Marathi equivalent for Holeya, are traditionally associated with the rural social system as village servants and watchmen (Kamath, 1982a, p. 476). In Mugad, the Mahar live in their own street, the Kurbar *oni*, and are nowadays engaged in making baskets and mats. The Korama in Kallapur make mats and brooms as well.

The different groups of Harijans, the Madiga and Madar, conduct different kinds of work. Traditionally both groups were engaged in leather work. Nowadays, some of them are still engaged in sweeping and leather work (making or repairing chapels and drums). But they are also engaged in agricultural wage labour. Madiga women in Mugad work as servants in the houses of the upper class. Quite a proportion of Madar and Madiga (19.4 per cent) cultivate their own land.

In addition to the economic activities of the different caste groups, the groups traditionally also have different religious and social functions. These cultural and social aspects are discussed in the next sections.

4.5. The cultural context

Having depicted the situational, demographic, historical, and economic features of the research area, we now focus on the cultural and social aspects. Cultural and social factors can hardly be separated as they are interrelated. However, for reasons of clarity we divide the two topics over two sections. In this section we focus on the cultural aspects and subsequently, in Section 4.6, we discuss social aspects like the actual distribution of caste groups in the villages, types of family, the marriage system and the position of women in this particular area of India.

Looking at the model in Chapter 2, beliefs regarding food intake during pregnancy are related to socio-cultural factors like religion, type of family, and bodies of knowledge of which the medical system Ayurveda is most important. In the first subsection we discuss different religious concepts of Hinduism, concepts regarding purity and pollution which determines the social structure of caste groups. In the next subsection, we continue on some other concepts, i.e. those derived from the medical system of Ayurveda. These concepts generate beliefs about food intake during pregnancy.

4.5.1. Religion

The majority of the villagers adhere to the Hindu religion. According to our census, of the 2,040 households, 89.4 per cent are Hindu, 9.3 Muslim, one per cent belongs to the tribal people Gouli, and only 0.1 per cent (three households only) are Christian. A similar number (N=3) belong to other tribes like the Lambani. This religious distribution reflects the population composition of both Karnataka and India, where the proportion of Hindus and Muslims amount to 86.5 and 10.6 per cent, and 81.7 and 12.6 per cent, respectively.

Table 4.7 shows the distribution of religious groups within the different research villages. The villages of Goutan Nagalavi and Ramapur are Hindu only. Mugad, Mavinkoppa, and Devageri have the largest proportion of Muslim households. All Gouli present in the research area live in the hamlet Tanda Ramachandran.

Traditionally, based on the old scriptures Hindu society is divided into four groups (the varna): the Brahmins (the priests and scholars), the Kshatriyas (the soldiers and rulers), the Vaishyas (the tradesmen) and the Shudras (the cultivators). However, many of the castes in Karnataka are tribal in origin and have nothing to do with the classification introduced by the varna system (Kamath, 1982a, p. 451).

In village life the social caste component is the *jati* defined as an intra-village, endogamous, hereditary social group that has a name and a combination of attributes (Mandelbaum, 1970, p. 14). A *jati* is related to a specialized occupation and is accordingly ranked in the social hierarchy. Traditionally, criteria of ranking have to do with ritual pollution and purity which are inherent in the group's practices.

Table 4.7. Religious composition of the households, per village

Village	N	Hindu N	Muslim N	Christian N	Gouli N	Other tribes N
Mugad	707	614	88	3		2
Mandihal	193	191	2			
W. Nagalavi	67	56	11			
S. Nagalavi	26	22	4			
G. Nagalavi	20	20				
Ramapur	174	174				
Veerapur	122	118	4			
Kallapur	123	120	3			
Devarhubli	300	284	16			
Lalgatti	56	50	6			
Devageri	67	47	20			
Holtikoti	105	90	14			1
Tanda Ramachandran	22	2			20	
Mavinkoppa	58	36	22			
Total	2,040	1,824 89.4%	190 9.3%	3 0.1%	20 1%	3 0.1%

In this view, higher *jatis* are less defiled and keep themselves more pure while the lowest *jatis* are most polluted (Mandelbaum, 1970, p. 184).

The rules of purity and pollution are related to the bodily processes of human and animal beings. The principle of pollution is most important: becoming polluted means that relationships with Gods and men are barred. Pollution leads to avoidance of and seclusion from other people, and if one is polluted, one cannot worship the Gods. Two kinds of pollution are distinguished. First, temporary, personal pollution pertains to any person and can easily be reversed by purification rituals. All bodily emissions such as excreta and blood are considered polluting. Traditionally, menstruating women are secluded until they have had their purification bath. Child birth and death are events which are considered as highly polluting. As will be seen in Chapter 8, women who have given birth and their children are isolated and separated from others for a certain period. Purification is enacted by taking baths and putting on clean clothes. The second kind of pollution —called the permanent, corporate pollution— is ascribed to a whole *jati*, is permanent, and cannot be reversed. This kind of pollution leads to the hierarchy present in Hindu society in which the lowest castes and outcastes are permanently considered as being polluting. People traditionally dealing with polluting things are considered impure. The Harijans, who work with dead animals and their skin are most polluting. But also the Dhobi's, who wash polluted clothes and extra polluted menstrual clothes, the barbers attending to the hair growth of persons, the midwives (traditionally often the barber's wives) who deal with childbirth are, although to a lesser extent, polluting. Even when the

people are no longer involved in their traditional occupation, they still are considered as being of the lowest, most impure caste (Mandelbaum, 1970, pp. 183-190).

The ranking of *jatis* according to the rules of purity and pollution are perceptible in rules with regard to food. Epstein stated that

> "from whom a caste eats what kind of food reflects its rank in the caste hierarchy" (Epstein, 1962, p. 156).

Food prepared by a lower *jati* is considered polluting for the higher castes and cannot be eaten. Vegetarianism is seen as the purest form.

These are the basic principles of Hindu society; in reality groups adhere in different degrees to these principles of purity and pollution. In the villages, some principles are observed, like those with regard to menstruation, childbirth, and death. When we conducted interviews among the Madiga women in their street in Mugad, we had to make a roundabout way home. Having been in the Harijan street for several hours, we were highly polluting for the people we would meet on the road. Another example: The Brahmin assistant in the research project had no problem with measurement of weight and mid-upper-arm circumference among Madar women, but when she measured the weight of a new born child, she had to take a bath before entering her own house again. Summarizing, principles of purity and pollution are observed in the villages. Relatively, however, the rules are less strict. If only because of a very practical reason; there are less possibilities to observe the rules. Water —for ritual cleaning— is scarce and very often there are no new or clean clothes to put on.

Hinduism is present everywhere in daily life. We could say that Hinduism is not so much a religion as much as a way of life. This becomes apparent in the daily baths, the daily *pujas* in the God's room in the house, the abundant festivals, and the visits to the temples. In all villages, there are several temples for different Gods and Goddesses, each requiring prayers on a special day (see Subsection 4.1.3). The temples dedicated to the Goddess Durgavva or Dyamavva, requiring prayers on Tuesdays and Fridays, and visited by women, are related to fertility. Men worship this Goddess once a year during a special *puja* before they start sowing the lands.

Astrology plays an important role in society. People conduct agricultural activities, marriages, travels, name giving of children, and any other important event only after having consulted the *Panchanga* or an astrologer who advises about the most auspicious day and time.

Offshoots of Hinduism are Jainism and the Lingayat movement. Jain religion plays an important part in the history of Karnataka. The religious movement was founded by the sage Mahavira who lived between 540 BC to 468 BC. He proclaimed egalitarian ideas, against the caste system. As is stated "one can not be considered a Kshatriya or a Brahmin by virtue of his birth. One is a Brahmin, Kshatriya or Sudra by action" (Kalghatgi, 1977, p. 88).

The most important principle consists of the concept of non-violence (*ahimsa*, also known in Hinduism). It implies refrainment from all injury and violence, to all living beings. Jain priests have been known to wear a mouth cap and to sweep the floor while walking in order not to

kill any animal on the way. As may be clear, Jains are purely vegetarian (Kamath, 1982a; Devadoss, 1977).

The Lingayat religion is originally a reform movement, founded by the prophet Basava in the 12th century in the northern part of Karnataka. The principles of the movement are formulated in the Basava Purana, the teachings of the sage (Kamath, 1982a; Mandelbaum, 1970; Ishwaran, 1983). The reform was aimed at both Hinduism and Jainism, the latter being quite powerful at that time. A main principle of the movement is that "religion is a personal affair and all people are equal and brothers in matters of religion" (Sahkare, 1978, p. 318-328).

These egalitarian views are reflected in the fact that caste hierarchy was ignored and women were treated as religious equals. Some fundamental principles of pollution known in the all present system of Hinduism, like those of birth, death, and menstruation were abolished (Mandelbaum, 1970, p. 537). Lingayats are Virashaivists, which means they worship Shiva. The name Lingayat is related to the *lingam*, the symbol of Shiva displayed in the temples dedicated to him and here worn as a decoration on the body. Lingayats are vegetarian and are not supposed to drink alcohol. Although in the founding scriptures the movement states it is egalitarian and anti caste, the group itself is divided into different sub-groups of which the Jangamas, the priestly section, are considered superior (Kamath, 1982a, p. 475; Mandelbaum, 1970, p. 537). These different sub-groups are discussed in Subsection 4.6.1.

Besides Hinduism, a small proportion of the study population consists of Muslims. The different sub-groups and other social aspects are discussed in detail in Subsection 4.6.1. Other small groups are the tribal people Gouli and the Christians. The Gouli were discussed in Section 4.3. Most Christians in India are converted and were formerly Hindus. In general, people still know their caste background. In the newspapers, in the 'Bride and bridegroom wanted' advertisements, Brahmin Christians ask for a suitable, i.e. also a Brahmin Christian, partner. Another example illustrating the influence of Hinduism on Christianity is the wedding of a Christian couple whose family consulted the (Hindu) astrologer about the right, auspicious time to marry. This example of the influence of Hinduism into Christianity (and also in Islam as we will see later on) is not meant to weaken the importance of the other religions, but precisely to indicate the overall influence of Hinduism.

In the next section, we describe an important body of knowledge nestled within Hinduism, i.e. important for our research topic: the medical system of Ayurveda.

4.5.2. The medical system Ayurveda

In the research project, we focus on the reasons behind the custom of reduction of food intake during the last trimester of pregnancy. In Chapter 1, we formulated that we expect that the custom is predominantly determined by cultural and social factors. Subsequently, in Chapter 2, we focused on the beliefs about food intake during pregnancy which, as we postulated, will be related to bodies of knowledge. With respect to food intake and health status of mother and child, the medical system Ayurveda will be most important.

Aware of the impossibility of describing a complex medical system like Ayurveda in just a few pages, without over-simplifying, in this section we discuss its basic principles, as far as they are relevant for understanding nutritional behaviour during pregnancy (see Chapter 7).

The information presented in this section is derived from literature (of which the book of Lad, 1992 has been very useful) and illustrated with examples from the research area.

Like the Hindu religion in general, the ideas prevalent in Ayurveda are very much integrated in people's daily life. As Kakar (1990, pp. 220-224) states:

> "the ideas of Ayurveda constitute the cultural prism through which men and women throughout India have traditionally viewed the person and his state of well-being".

Ayurveda, literally 'science of living' is embedded in the Hindu religious system. The medical system has been practised by people for thousands of years, not only in India but in other Asian countries as well. The most important books in Ayurveda, the Charaka Samhita and the Susruta Samhita were written around 700 and 600 BC, respectively. Like biomedical science, Ayurveda has its specializations, like paediatrics, gynaecology, etcetera.

Within Ayurveda, a human being is seen as a micro-cosmos of nature (Lad, 1992, p. 10) in constant exchange with the macro-cosmos. Like nature, a human being is constituted of the five basic elements earth, water, fire, air, and ether. Ether is manifested in the body in the cavities like the nose, mouth, and respiratory system. Air is the element of movement and takes care of movements of the muscles, heart beat, contraction of lungs, movements of guts and stomach, and movements of the central nervous system. Fire is for digestion of food and is associated with body temperature, thinking, and eyesight. Water is manifest in excretion of digestive fluids, salivary glands, blood plasma, and cytoplasm. The last element, earth, is manifest in all solid structures like the bones, cartilage, nails, muscles, skin, and hair.

In Ayurveda, the theory of *tridosha* is central. The human body is constituted of the three humours *vata*, *pitta*, and *kapha* which are manifestations of the five basic elements mentioned above. *Vata* represents air and ether, *pitta* fire and water, and *kapha* earth and water. (There are again five kinds of *pitta*, *vata* and *kapha* (Frawley, 1989) but we will not elaborate on this). The three humours control all biological, psychological, and physiopathological functions of the body, mind, and soul (Lad, 1992, p. 15). The functions of the three humours can be deduced from those of the basic elements mentioned above. *Pitta* for example takes care of digestion and absorption of food, of body temperature, the colour of the skin, and radiance of the eyes. *Kapha* keeps the elements of the body together and takes care of (among other things) stability and resistance of the body. In good health, the three humours are in equilibrium. An imbalance. i.e. either too much *vata*, *pitta*, or *kapha*, results in physical illnesses or a disturbance in mental or emotional well-being.

Each of the body humours is located in certain parts of the body. *Vata* is located in the large intestine, the abdomen, the skin, ears, bones, and thighs, and too much *vata* creates problems in these parts of the body. *Vata* illnesses are characterized by pain: nervous system disorders, tremors, epilepsy, and arthritis (Frawley, 1989, p. 35). *Pitta* is located in the small intestine, the stomach, in blood, the eyes, and the skin, and too much *pitta* creates problems in these places. *Pitta* diseases are characterized by fever or burning sensation: ulcers, acidity, boils and skin rashes. *Kapha* is located in the chest, throat, head, sinuses, nose, mouth and the stomach, and in plasma. Too much *kapha* leads to problems in this area. *Kapha* diseases are

characterized by phlegm: illnesses of the respiratory system, colds, and cough (Lad, 1992; Frawley, 1989).

The body constitution of a person, i.e. the apportionment of the three humours, is determined at the time of conception (Lad, 1992, p. 18). Different body constitutions, each characterized by a different composition of the *doshas*, can be discerned. One can be a *kapha*-type for example, which means that *kapha* dominates in the constitution and one is more susceptible for *kapha* diseases. A *vata-pitta* type has relatively more of these two *doshas*. The basic body constitution cannot be changed, it will remain the same throughout life (Lad, 1992, p. 18).

Vata, *pitta*, and *kapha* each have different attributes which are categorized in diametrical concepts. Ten pairs of attributes can be discerned of which the concepts heating versus cooling, heavy versus light, static versus dynamic, moist versus dry are most important here. *Kapha*, for example, is related to the attributes cold, heavy, and moist while *vata* is cold too but light and dry. *Pitta* is related to hot and light (Lad, 1992, pp. 41-44; Frawley, 1989, p. 5).

External factors, i.e. factors influencing the body from outside, influence the balance between the three humours. Food and the way of living, but also factors like season, time of the day and the planets are some external factors mentioned by different authors (Kakar, 1990; Lad, 1992; Spijker, 1989). Like *pitta*, *vata*, and *kapha*, these factors have the same attributes of heating versus cooling, light versus heavy, etcetera. Items or deeds with equal attributes induce an increase in the related body humour. Some examples from the research area might clarify the principle of diametrical attributes of food. Papaya is commonly classified as heating, curds and buttermilk as cooling. Eating too much papaya leads to an increase of *pitta* in the body. Eating too much buttermilk or curds leads to an increase in *kapha* inducing illnesses like cough and cold. However, other external factors play a role. In the summer season (which is heating, light, dynamic), more heat is created in the body which can be counterbalanced by the cooling effects of curds and buttermilk. On the other hand, these cooling items should be avoided during the cold winter season. Neighbours in Dharwad warned the researcher not to eat too much potato (as she did as a good Dutchman) because it would create too much *vata* and give gas problems in the gut. Times of the day, too, have their attributes. In the middle of the day, especially during the summer season, there is more heat. The villagers told us not to work too hard during these hours, as the heat and hard work would create an excess of heat, leading to pain in the eyes, red skin, headache, etcetera.

In addition, each period in life is associated with a surplus of one of the three *doshas*. Childhood is related to a surplus of *kapha*, children experiencing *kapha* illnesses like respiratory diseases, cough, cold, and pneumonia (see also Chapter 7). Adulthood is related to too much *pitta*, and in old age there is more *vata* (Lad, 1992, p. 20).

During illnesses, which indicate an imbalance between the three humours, food can counter-balance. If one has a throat infection, which means there is too much *kapha*, one should avoid cooling foodstuffs. Ayurvedic herbal medicines, too, can be taken to create a balance again.

Besides an equilibrium between the three humours, the concept of health within Ayurveda comprises more. It includes the following. *Agni*, the all-digesting fire should be in balance.

The three *malas*, i.e. residual products like urine, faeces, and sweat should be produced in normal amounts and be in equilibrium. The senses should function in a normal way and the body, mind, and soul should be in harmony (Lad, 1992, p. 29). However, to understand food behaviour during pregnancy, here the ideas related to the three *doshas* are most important. A further classification of food in the six tastes sweet, salty, sour, pungent, bitter, and astringent is discussed in Chapter 7.

Besides the overall presence of beliefs related to Ayurveda among laypersons, there are Ayurvedic practitioners who have received an education at one of the Ayurvedic colleges. These medically trained people are established doctors in, for example, Dharwad. Medication consists of diet prescriptions (which are most important), herbal medicines or prescriptions regarding a change in way of living. But yoga and meditation, treatment with gems, physical training, and surgery may also be prescribed.

4.6. The social context

In this section, we discuss the social context in the research area. The items discussed, the different social groups in the villages (Subsection 4.6.1), the marriage system (Subsection 4.6.2), the types of households and families (Subsection 4.6.3), and the status of women (Subsection 4.6.4) are generated by the cultural aspects as discussed in Section 4.5.

4.6.1. Different social groups in the villages

In the national census of India, questions regarding a sensitive topic like caste are not posed. Only a classification of scheduled and backward tribe or caste is used. Caste groups in Karnataka classified as such are, among others, the Madiga and Madar, Vodda, Mahar, Bovi, Korama, and Walmiki. The Goulis are classified as a Backward Tribe (Kamath, 1982a, pp. 413-417; pp. 463-464). In total, in the research area 19.6 per cent of the households belong to scheduled caste or tribe.

In this section, the different *jatis* present in the research villages are presented in a more or less hierarchical way. This hierarchical order is disputable as Epstein (1962) and Mandelbaum (1970) also conclude. Castes are not always ranked in the same order by different caste communities. In addition, differences between villages exist, and sometimes caste and socio-economic status intermingle. Not only Hindus are ranked in a hierarchy, also groups outside Hinduism, like the Muslims and Goulis are part of the social structure and classified accordingly by the villagers. The Gouli, for example, are placed higher in the social hierarchy than outcastes.

In this section, we describe the different socio-religious groups present in the research area taking into account the socio-cultural context. Economic activities have been described in detail in Subsection 4.4.2. Here, we refer briefly to these economic activities, only if relevant.

Table 4.8 presents the prevalence of the different groups in the research villages. 25.9 per cent of all households belong to Lingayat, another 19.9 per cent to Maratha. As mentioned before, 9.3 per cent of the households adhere to the Islam. Following the groups of Walmiki

and Kuruba, which have a share of 7.7 and 7.6 per cent of the households respectively, other groups constitute only a small proportion of the total population.

Brahmins are ranked highest in the Hindu hierarchy. They are strictly vegetarian. Only seventeen Brahmin households live in the research area. In Devarhubli, a colony of Brahmin households resides near the old Ranganath temple. One of these families is engaged in priestly activities. The others are primarily engaged in agriculture or government services. In a few other villages, one or two Brahmin households are present. Often, these people come from outside and are either teachers, conduct social work, or work for the railway company.

Jains constitute only 5.1 per cent of the total number of households in the research villages but their socio-economic position is high. The majority of them live in Mugad, high on the hill. This location of the colony indicates the higher socio-cultural position of the group (see also Subsection 4.1.3): inhabitants of the village (some of them polluting) do not easily pass their houses. Jains have been an influential group in this village for a long time (see Section 4.3). A temple is situated amidst their houses in the colony. They are mainly cultivators.

The Lingayat constitute 25.9 per cent of all households. Traditionally, as described in Section 4.5, this group is not part of Hinduism and as a reform movement even opposed it. However, in reality the Lingayats are part of the caste system and play an influential role in the Dharwad region. Most of the Lingayat in the research area (72.1 per cent) are primarily engaged in agriculture. In Devarhubli and Mandihal, there are *mathas* in which a Lingayat priest resides. These priests conduct religious duties not only for Lingayats, but also for other caste groups. Different groups of Lingayat in the research area are the Hiremath, Panchamsali, and Banajiga (see also Ishwaran, 1968). People can convert to the Lingayat religion: in the villages potters, barbers, *dhobis*, and Harijans had converted. They have to restrict themselves to vegetarianism and observe other religious rules. However, their social status still will be related to their former caste group.

Only a few Kshatriyas live in the research area (predominantly in Warava Nagalavi); they are mainly engaged in agriculture and (agricultural) coolie work. The Maratha caste, cultivators, claim to belong to the Kshatriyas (Kamath, 1982a, p. 477). This Maratha group accounts for 20.1 per cent of all households. Here, the fact that the Dharwad District formerly belonged to Bombay Presidency becomes evident. The Marathas are the people from the state of Maharashtra, where they speak the language Marathi. Historically, the Maratha chiefs rose up on the decline of the Moghuls. The chiefs recruited people from different tribes to act as warriors and protect the Brahmins and cows from attack by the Muslims. After these Maratha wars, they were dispersed and settled down mostly as cultivators (Nanjudaiah, 1920). In the villages, a subdivision between the Shivaji and the Kulwadi exists, the latter being lower in hierarchy. The two groups do not intermarry. Both groups are non-vegetarian.

Table 4.8. Number of households per caste group or religious group, per village

Groups	Area	Mugad	Mandihal	Warava Nagalavi	Station Nagalavi	Goutan Nagalavi	Ramapur	Veerapur
	N	N	N	N	N	N	N	N
Lingayat	529	181	61	8	1		59	26
Maratha	406	67	27	1	6	1	22	73
Walmiki	157	24	16	20	3		21	10
Kurbar	155	66	20		2		41	1
Jain	103	60		3				
Vodda	100	75		3		19		
Madiga	58	22	15	1	2			
Panchal	58	9	12		1		8	6
Kshatriya	51	1		17	2		12	
Bovi	32	32						
Uppar	28	5	21		1		1	
Hadpad	22	7	11				1	
Brahmin	17	5		1	1			
Ambiga	15	13			1		1	
Madar	15							2
Mahar	15	12						
Kumbar	15	14	1					
Madiwalar	9	2	6	1				
Others	41	18	1	2	3		8	
Muslim	188	88	2	10	3			4
Gouli	20							
Other tribes	3	2						
Christian	3	3						
Total	2,040	707	193	67	26	20	174	122

Groups	Kallapur	Devarhubli	Lalgatti	Devageri	Holtikoti	Tanda Ramachandran	Mavinkoppa
	N	N	N	N	N	N	N
Lingayat	16	133	7	2	20		5
Maratha	43	42	24	36	46		18
Walmiki	17	32	3		8	1	2
Kurbar	16	1	5		1	1	1
Jain	11	24	1				4
Vodda					1		2
Madiga		14	3	6			
Panchal	6	10			6		
Kshatriya		13	6				
Bovi							
Uppar							
Hadpad	1	2					
Brahmin	1	6	1		2		
Ambiga							
Madar	3				2		2
Mahar				2			2
Kumbar							
Madiwalar							
Others	6	7		1	5		
Muslim	3	16	6	20	14		22
Gouli						20	
Other tribes							
Christian							
Total	123	300	56	67	105	22	58

The group of artisans, the Panchal, consists of five subgroups of which the carpenters (Badiger) and the blacksmiths (Kammar) are the most important here. Also a few households of Pattar (goldsmiths) live in the area. The Panchal form only a small proportion of the population (2.9 per cent of all households). Their economic activities and the way they are remunerated are described in Subsection 4.3.2. Panchal are vegetarian.

In the research area, 9.4 per cent of the population adheres to the Muslim religion. The majority live in Mugad, in the Muslim and Masjid oni. In Mavinkoppa, a large proportion of all households (37.9 per cent) is Muslim. In Devarhubli the Muslims live in a small colony together. Socio-economic status among Muslims in the research area differs greatly. The group in Devarhubli is one of the richest families in the village and in Mugad too some of the Muslim families are ranked high in the socio-economic hierarchy. Many others, however, belong to the poorest families.

Leaving aside religious life, we want to highlight the social differences between Hindus and Muslims. Besides Kannada, many Muslims speak their own language Urdu. Some variation in clothes can be observed too. Young Muslim girls wear the *salwar kameez* or *churidar*. Outside married women must cover themselves with the black *burkha*. Women are more secluded in the house. Muslims are not vegetarian, they only have to avoid pork. In contrast with the Hindus, parallel cousin marriages are allowed. Besides these differences, however, there are also similarities with Hinduism (Mandelbaum, 1970). Muslims are also divided into different hierarchically ordered sub-groups: the Shaikh, the Sayyad, the Mughal, and Pathan. Like castes these are hereditary groups. Mandelbaum states that these groups are endogamous (and may not intermarry), but the Muslim leader in Mugad told us that only the first group is endogamous. Besides this subdivision, certain Muslim groups are associated with a certain occupation (like castes). The Pinjara, for example, are traditionally engaged in the business of cotton and mattresses, the Kasai in mutton selling, the Bhagwan in selling vegetables. There are more similarities: Mandelbaum (1970, p. 247) even talks of Muslim untouchables. However, compared with Hindus, the division between the groups is less strict: Muslims interdine, go to the same mosque, and also the rules with regard to pollution, although present, are more diffuse.

The group of Sidi, living in Mavinkoppa, also adheres to the Muslim religion. The Sidi are reported to originate from Africa, either as slaves or pirates. Their black curly hair and dark skin still reflects their origin.

In the whole research area, only three families are Christian. All three live in Mugad. The old school teacher's family has already lived in the village for many years. The other families consist of the government nurse and her family (her husband worked in the research project) who was transferred to this village, and a family whose head works in the railway company in Mugad Station.

The potters, the Kumbar, predominantly live in Mugad and Devarhubli. (The latter, however, is not indicated in table 4.8 as the potters in this village are converted to Lingayat religion). The Kurbar, traditionally the shepherds and blanket weavers, live predominantly in the villages of Mugad, Mandihal, and Ramapur. Traditionally, the Dhobi (Madiwalar) and Barbers

(Hadpad) and some groups of the Panchal are engaged in religious functions. The Dhobi perform rituals during maturity ceremonies, marriages, and burials (Epstein, 1962, p. 164). Barbers have ritual functions like cutting hair at the tonsure or funeral ceremony, and also are known as the flute players at festivals and wedding ceremonies.

Besides a single person from another tribe (such as Lambani), the Gouli in Tanda Ramachandran are the only tribal people in the research area. Most of them still speak their own mother language, Marathi. Besides the language, also the way in which their houses are decorated, the way in which the women wear their *saree*, their ornaments, and tattoos are different from the other groups. The Gouli observe the same kind of pollution rules. During menstruation, Gouli women, like the more orthodox Hindus, must sit outside and eat separately until they have had their ritual bath.

Other caste groups, lower in the social hierarchy, consist of the Walmiki (7.7 per cent of all households), Kurbar (7.6 per cent), and Vodda (4.9 per cent). The Walmiki, also known as Beta, or Naik, or Talwar, are traditionally hunters and fowlers. Nowadays, in the research area, 47 per cent of the Walmiki households are engaged in agriculture. The Vodda are traditionally the stonecutters and most of them still are engaged in this work in the stone quarries. The group of fishermen, the Bhovi, live predominantly in Mugad.

Harijans are divided into different sub-groups, like castes ranked in a social hierarchy based on the same rules of purity and pollution. A study in Dharwad city identified ten different sub-groups of Harijans. The scavengers are regarded as the most polluted and lowest group. And also within the group of Harijans, the higher ranked group does not accept food from the lower groups (Kadetotad, 1977, pp. 32-33). In the research area, both Madiga and Madar live. In the traditional villages Mugad and Devarhubli, the Madiga live in one street together and have their own small temple and own water tap. A small number of Madar households live in the villages of Veerapur, Holtikoti, and Mavinkoppa. At festivals like wedding parties, Harijan's presence is necessary to beat the drum. And during the Hoolie festival in February/ March, which all caste groups attend, the fire to burn the statue of Kama must traditionally come from the pyre set up by the Harijans (Marulasiddhaiah, 1969, p. 36).

All these different groups have their own rules and customs regarding maturity, marriage, widow remarriages, divorces, and death and funeral prescriptions. The marriage system is discussed in the next section.

4.6.2. The marriage system

Marriages take place within the caste (sub-)group. Most marriages in the villages are arranged, only very few so-called love marriages take place. As they are arranged by the parents, marriages are not seen as the establishment of a relationship between two individuals, but rather of one between two families. The future bridegroom and bride sometimes have a say in the decision about who to marry, but their actual contribution is small. The major decisions are made by the (head of the) family. The most important criterium in the selection of a bride or bridegroom seems to be the economic and social status of the future family-in-law. The horoscopes of the spouses are also compared. In the villages, the *Nakshatra* names of the

future couple are matched. The *Nakshatra* name is given at the time of birth and is determined by the planets in force at that time (see also Chapter 8).

As the families, and especially the men, make the arrangements and agreements regarding the wedding and dowry, the future spouses hardly meet. They may see each other during special rituals conducted in order to confirm the established relationship between the two families. Sometimes they even do not meet before the actual wedding takes place. At the actual wedding, the spouses undergo an elaborate ceremony. We briefly (leaving out many details) discuss a wedding of a Maratha Kulwadi couple.

The actual marriage ceremony started at the end of the afternoon, when the future bride, accompanied by female family members and a number of steel trunks, arrived by bullock cart and was dropped by her father near the entrance of the village. The family members of the husband (not himself) went in procession to the temple, first to see her and secondly to bring her to her husband's house. That evening, several ceremonies were conducted: the waving of aarti before man and woman, the turmeric massages and baths, the sobhaana sung by the husband's female family members for the bride, the green glass bangles provided to all women, and an elaborate meal. During the night, several other ceremonies were conducted, while in the morning the actual wedding took place. First, the couple visited several houses in the village and were then placed on wooden planks, their family members sitting behind them. Again aarti was waved, turmeric applied to the bodies of all participants and then lots of water was poured. After this, the wet clothes were taken off and new ones, bought for the wedding, put on. The men visited the temple and while coming back the actual conclusion of the wedding took place. The time of conclusion again is an auspicious one determined by an astrologer. Wearing beautiful head decorations, the couple stood facing each other but separated by a curtain. A priest recited mantras and at the time the curtain fell, everyone threw coloured rice. The binding of the mangala sutra, or tali, a chain of black beads and a golden pendant marks the marital status of the woman. After some more ceremonies, the couple sat down and received the congratulations and presents. A meal was provided to all visitors.

From the marriage onwards, the girl belongs to the family of her husband and lives in his house with his family. In Subsection 4.3.4 we discuss the consequences of patrilocality for the position of women.

Marriages between family members are common in this region, especially cross-cousin and maternal uncle-niece marriages. Child marriages, although forbidden by law, are still concluded: most often between kinsmen. After the wedding ceremony, the girl returns to her parents, and only after reaching maturity does she go to her husband's house and is the marriage consummated.

At the time of marriage, a dowry is paid by the parents of the girl to her husband's family. The size of the dowry depends on socio-economic status of the families concerned. In the rural area, it predominantly consists of money, but it may also contain luxury items (such as watches). In addition, the girl is sent to her husband's house with all kind of kitchen articles.

4.6.3. Types of household and family

The basic social unit in the village is the family, the *kutumba*. The family is distinguished from a household, the former constituting a social unit on the basis of blood ties. Most households are headed by men, but still 15.5 per cent of all heads of the household in the research area are female. The majority (92.4 per cent) of these women are older than 30 years and 80.7 per cent of them are widows.

In addition, two different types of households can be distinguished: the single and co-residing household. In the first category a household, defined as a group of people preparing their food in one kitchen and keeping a common household account (see Chapter 3), lives in one house. In the second category one household shares a house with other, family-related, households. Each household occupies its own part of the house, has a separate kitchen, and keeps a separate household account. In the study population, 24.7 per cent lived in such a co-residing household. The maximum number of households living in one house was found in Mandihal, where six households shared one house (which therefore had six kitchens). This form of co-residing is partly related to the breaking up of joint families. Often in the villages a son or brother with wife and children decides, after quarrels and fights, to break away from the joint family. Usually, however, they do not move out of the house but occupy a small place in the front of the house with an own kitchen and an own account.

Regarding the family, two broad categories can be discerned. A nuclear family constitutes husband and wife living with their unmarried children. A joint family consists of one or two parents living with their sons and their wives and children.

Combining the two classifications, a single household and nuclear family constitutes the family commonly known as nuclear. A single household and joint family is the more traditional form of household. Joint families are usually only affordable for richer families. Poor people cannot afford to live in a joint family and usually live in a nuclear family (Epstein, 1962; Mandelbaum, 1970). In the study population (see Chapter 5) this relationship between socio-economic status and type of family was observed as well.

Then there are the co-residing households, either nuclear or joint family: people keep their own household but still have the advantages of living together with family members in one house.

Besides these broad categories, in reality there are deviant forms of family formation. In some families, joint or nuclear, the child of a daughter is added to the household. While the daughter lives with her affinal family, a child of hers stays with her natal family (*tavaru mane*). There are a few cases of uxorilocal joint families, where against the general rule of patrilocality, the husband came to the woman's house after marriage. Practical reasons often underlie this kind of family. In most cases, the wife's family does not have a son and their daughter's husband is treated as such.

Other living arrangements consist of nuclear or joint families where one or more daughters live, with or without children, who came back home after being separated from their husband or being widowed. Adoption is another feature: families who do not have a son can adopt a boy, often family related. Orphans, too, are adopted by family members. Another small proportion of the households consist of one member only (N=71).

Summarizing, we come to the following data (table 4.9). Adding one parent families (N=101), 40.9 per cent of all households live in a nuclear family. 3.4 per cent consist of people living alone. Another 30.9 per cent of the households live in a single household, joint family. 17.3 per cent live in a co-residing household and nuclear family, and only 6.4 per cent in a co-residing household and joint family.

Of course, this whole classification by family types is time bound. A family, at this moment classified as nuclear, may have been a joint family some years ago when the parents were still alive. It can become a joint family again as soon as a son marries and brings his bride home (see also Chapter 5).

Moreover, here we made a classification of families which form an economic unit. But people in the village are related to each other and live, in separate households, together, often in one street or neighbourhood.

Table 4.9. Types of household and family in the research area

Kind of family		N	%
Single household		1,537	75.3
	nuclear family	835	40.9
	alone	71	3.5
	joint family	631	30.9
Co-residing household		503	24.7
	nuclear family	353	17.3
	alone	20	1.0
	joint family	130	6.4
Total		2,040	100

4.6.4. Status of women

The position of women in Indian society is reflected in the sex ratio (see Section 4.2). As mentioned before, in the Dharwad taluk the sex ratio is 948 females per 1,000 males. In the research area, the figure is lower still: 922 females per 1,000 males. This low sex ratio indicates a higher mortality among women and reflects the preference for sons in this society. Female foeticide is one of the extreme expressions of this preference. But girls are also observed to be breastfed for a shorter period, to receive less food during childhood, less health care, and less attention (Miller, 1981; Srinivasan and Kanitkar, 1989; Basu, 1989; UNICEF, 1991). At the reproductive age, maternal mortality adds to the high percentage of female deaths.

In this patrilinear society, a girl is seen as only a temporary member of her natal family: after marriage she will be part of her husband's family. This is indicated by the change in surname after marriage: a woman's father's name is replaced by her husband's. Sometimes not only the surname changes, but if the family-in-law likes, it may change her first name too. In those cases, a total change in identity takes place. From Shantavva K. Akki, for example, after marriage a woman may become Ningavva B. Patil. Several pregnant women, who we visited both in their affinal and natal family (where they delivered), appeared to have different names in the two places.

The fact that a girl becomes a member of her husband's family has important consequences. It is not considered worthwhile to invest in a girl who will leave the family, and as a consequence girls receive less education than boys. Moreover, educating a girl has an adverse effect. The rule of hypergamy means that a girl should marry a boy with a higher education. If a girl receives more education, and should marry a boy with even higher education, the dowry to be paid by her parents to the bridegroom's family would increase.

Immediately after the wedding ceremony (see Subsection 4.6.3) several customs ensure a gradual adjustment of the girl to her new family-in-law. During the first days in her husband's house, a sister or other female family member stays with her. And after this period, she is regularly allowed to travel home and stay with her own parents. Household duties are slowly allocated to her. However, she must adjust to her family-in-law, and especially the relationship with her mother-in-law can be sensitive.

A married woman can improve her status by giving birth to a child. Her first child is proof of her fertility. She can further improve her status by giving birth to sons who will continue the family line and take care of the death rituals later on.

This determination of the status of women by their reproductive role is nicely illustrated by three events considered to be important in a woman's life. Each is celebrated with a ceremony. During each ceremony a special song, a *sobhaana*, is sung by women. The first ceremony related to the reproductive cycle is the one conducted at the time of maturity when a girl is supposed 'to be big' (*dodakke*) and ready for marriage. The second *sobhaana* is sung (by women of her affinal family) during the wedding ceremony (see Subsection 4.6.2). The third ceremony is conducted during the first pregnancy (*kubasa*). A *kubasa* (literally: blouse piece) was attended among a Lingayat family.

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The ceremony was celebrated in the evening time and many people attended. The pregnant woman, in month seven of pregnancy, was nicely dressed in a green *saree* and wore green bangles, green being the colour of fertility. On her head she had a beautiful garland of flowers. During the ceremony, husband and wife sat together on a black blanket which was decorated with beautiful figures made of rice. *Aarti* was waved before the couple, the *sobhaana* sung by the women who attended. Presents were given too ... by the wife's natal family to her husband! In this case a watch was presented. The ceremony was concluded with a meal.

Besides reproduction, women play an important role in production. In general, women have to work hard in their husband's place (see also Chapter 5), either at home or outside in the fields. As we will see in the next chapter, the custom of 'sending a pregnant woman to her parent's house' in order to deliver has pleasant consequences for women as they can take more rest than in their husband's house.

Women, especially those just married, hardly go anywhere else than their husband's place, the fields, and their parent's place. There are rules for when a woman can be sent to either her natal family, or back to her affinal family. On Tuesdays, women cannot be sent back to her affinal family, while on Fridays they cannot be sent to their natal family. This expression, 'a woman is sent to ...' , already gives an idea of the lack of control women have over their own life.

At an older age however, if they have given birth to sons, women can improve their status and have more power: being a mother-in-law themselves, they supervise their own daughters-in-law.

In this chapter, we described the research area and the situational, economical, historical, social, and cultural context in which nutritional behaviour during pregnancy takes place. In the next chapter we discuss the characteristics of the study population: the pregnant women.

Chapter 5 The study population

In the analysis of the effects of food intake during pregnancy on the health condition of the mother and well-being of the child many intervening and background variables play a role. Figure 2.7 displays all variables included in the analysis, also the individual background characteristics (like age, parity, length of last birth interval,and prepregnancy weight-for-height status), and socio-economic background characteristics (like type of family, socio-economic status of the household, and use of antenatal care). In this chapter, we discuss these different characteristics of women in the study population.

First, we consider the composition of the study population. The way in which women were selected has been discussed in detail in Chapter 3 and here we only refer to the number of women included in the study population. In Subsection 5.1.2, the reproductive pattern of women in the study population like age, age at marriage, duration of marriage, parity, and length of last birth interval are discussed. In addition, one of the most important variables in the analysis, indicating the nutritional status of women before pregnancy, i.e. prepregnancy weight-for-height status, is discussed in Subsection 5.1.3. In Subsection 5.1.4, the socio-economic factors like religion, caste, source of income and type of family are described.

Furthermore, we discuss characteristics of the respondents prevalent during pregnancy: factors which affect health and well-being of both woman and child. The utilization of antenatal health care provided by the formal health system (Subsection 5.2.1) and compliance with iron and folic acid tablets and tetanus injections (Subsection 5.2.2), and food supplementation (Subsection 5.2.3) are considered. The prevalence of anaemia and other illnesses, as perceived by the respondents, is discussed in Subsection 5.2.4.

In Chapter 4, we already mentioned that antenatal services in the villages include check-ups, tetanus injections, and iron and folic acid tablets provided by the village health visitors (commonly called the local nurses). Food supplementation for pregnant women is part of the national programme of Integrated Child Development Service (ICDS). Pregnant women are registered by the *anganwadi* teacher in month five of the pregnancy (although the teacher might know earlier, especially in the small villages, that a woman is pregnant). From this month onwards, women considered to be vulnerable receive supplementary food from the *anganwadi* (up to six months after delivery). Vulnerable women are women who are poor, have to live on wage labour only and are in need of some extra food, or women who belong to the group of scheduled or backward caste and tribe (see Chapter 4). But also women with a history of many spontaneous abortions or stillbirths and women becoming pregnant at an older age are considered to be vulnerable. In addition to this criterion, targets are set for the *anganwadi* teachers: every year they should cover a certain number of women. For example, in Holtikoti —a village of 579 inhabitants— a minimum of five pregnant women must be covered.

The other characteristics prevalent during pregnancy refer to customs and practices applied during pregnancy. The rule of discontinuation of breastfeeding during pregnancy (Subsection 5.3.1) and the custom of delivery in the parents' house (*tavaru mane*) (Subsection 5.3.2) are discussed. In the last section (Subsection 5.3.3), daily physical activities conducted during pregnancy are considered.

5.1. Background characteristics

5.1.1. Composition

In the period May to September 1991 all women who became pregnant were selected to participate in the research project (see Table 5.1). Of the 241 women selected, a total of twenty nine dropped out, for various reasons. Most of these women (N=18) moved to their parents' place for delivery, which was too far away from the research area, making a follow-up impossible (see also Chapter 3). A few women (N=6) were away from home too often to participate. Others (N=4) did not tell us that they were pregnant or appeared to be much further in pregnancy than stated before. One woman moved away from the village because her husband was transferred to a job in another place.

Some of the women (N=26) who were selected had a spontaneous abortion, defined as a pregnancy ending before twenty eight weeks of gestation. This means that of all the pregnant women, 12.3 per cent experienced a spontaneous abortion. There might be a small bias in this estimate, however, as measurement is difficult. For example, for a woman who thought she

Table 5.1. The study population

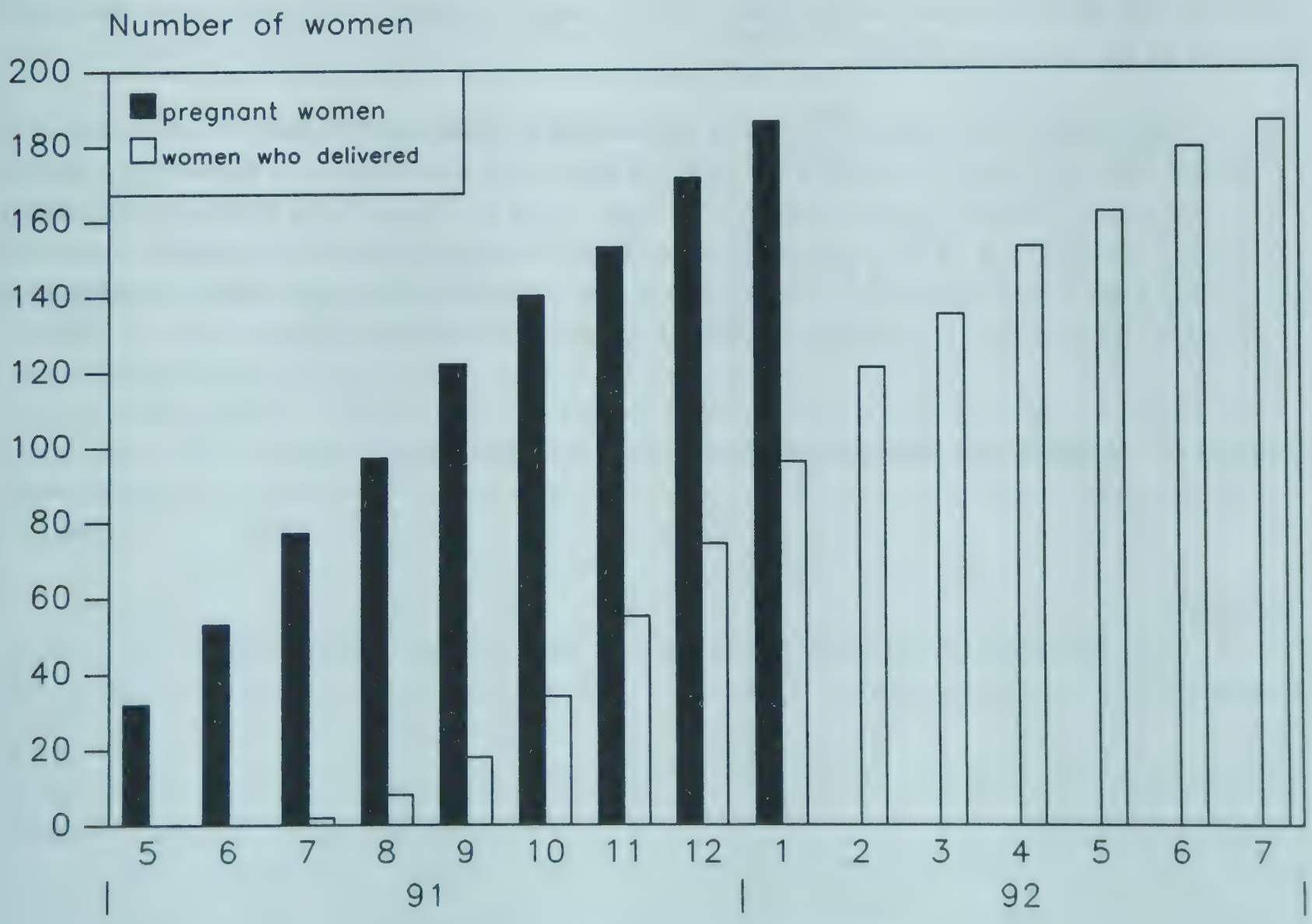
Number of pregnant women selected between May 1991 to January 1992		241	
Number of pregnant women, who dropped out		29	(12.0%)
Number of spontaneous abortions (pregnancy outcome before 28 weeks of pregnancy)		26	(12.3%)
Actual study population of pregnant women		186	
Number of children born alive		176	
	females	92	(52.3%)
	males	84	(47.7%)
Number of stillbirths (pregnancy outcome after 28 weeks of pregnancy)		11	
	macerated	8	
	fresh	3	
	females	3	
	males	4	
	Unknown	4	
Number of children born alive who died within a few hours after delivery		4	
	females	2	
	males	2	
Number of children born alive who died during the first month of life		2	
Number of women who died due to pregnancy		1	

was pregnant but had her periods again after two months it was difficult to know whether she had had a spontaneous abortion or just a delayed menstruation.

The final study population consists of 186 pregnant women, living in ten different research villages. The cumulative number of pregnant women participating in the research project, by month of entry in the study population, is depicted in Figure 5.1. In the beginning of the project (May 1991), women who were already pregnant (but not more than six months) were selected (see also Chapter 3). This initial group of pregnant women amounted to 32. In January 1992, the last pregnant women were selected. As women were commonly selected in the third or fourth month of pregnancy, this last group of women had their last period in September 1991. The first child in the research project was born in July 1991, the last one a year later in July 1992. Data on the cumulative number of children born, i.e. the cumulative number of women who delivered, are also presented in Figure 5.1.

Of these 186 women, 175 gave birth to 176 live births (one set of twins were born), 52.3 per cent girls, 47.7 per cent boys. The other eleven women experienced a stillbirth: children born dead after a pregnancy of more than 28 weeks. Most (N=8) were macerated stillbirths.

Figure 5.1. Composition of the study population, from May 1991 to July 1992



Only few (N=3) were fresh stillbirths (children dying during the process of labour). Four of these stillbirths were male, and three female (for the other four cases the sex could not be registered). These data imply a stillbirth rate of 51.9 per 1,000 pregnancies.

Of the children born alive, four (two boys, two girls) died almost immediately after birth (early neonatal death) either as a consequence of complications during delivery (such as the umbilical cord twisted around the neck) or because of congenital malformations. These data imply a perinatal mortality rate of 85.0 per 1,000 live births, a figure much higher than either at the national level (50.0 per 1,000 live births) or the state level (57.0 deaths per 1,000 live births). As during the first month of life two more children died, a neonatal mortality rate of 34 per 1,000 live births results, much lower than the rates at national and state level (see Chapter 2). One woman died a few days after pregnancy due to complications associated with one of the indirect causes of maternal mortality (see Subsection 2.1.1), viral hepatitis. Maternal mortality thus amounts to 538 per 100,000 live births in this study population.

5.1.2. Individual characteristics: the reproductive pattern

In the relationship between food intake and maternal weight gain, and birth weight of children, individual characteristics like the reproductive pattern and prepregnancy weight-for-height status (see Figure 2.7) play an important intervening role: these maternal factors constitute the starting position for the child. In this subsection we focus on the first category only and discuss demographic variables like age, parity, and length of last birth interval, age at marriage and duration of marriage as well. Prepregnancy weight-for-height status is discussed in detail in the next subsection.

The age and parity distribution of the study population is presented in Table 5.2. The majority of women belong to the age classes of 14 to 24 years. Parity, defined as the number of live births born to a woman ranges from zero to eight. 22.6 per cent of the women in the study population (N=42) are of zero parity. Most of these women (N=40) are between 14 and 19 years old. Two women have their first child only at a relatively late age. One of them indeed is pregnant for the first time, the other had a spontaneous abortion before.

Table 5.2. Number and percentage of women by age and parity

	Parity						NS	Total	
Age (years)	0	1	2	3	4	5+			
14-19	28	16	6					50	27.0%
20-24	12	16	31	11	1			71	38.4%
25-29	2	5	18	10	6	2		43	23.2%
30-34		2		5	6	4		17	9.2%
35-38				1	2	1		4	2.2%
NS							1	1	
Total N	42	39	55	27	15	7	1	186	
%	22.7	21.1	29.7	14.6	8.1	3.8		100	

Taking into account the number of pregnancies, and thus including these former spontaneous abortions and stillbirths, only 18.3 per cent (N=34) of the women are pregnant for the first time. The higher parity women are concentrated in the higher age group. One woman in the age group of 20 to 24 years old has already given birth to four children.

Of 186 women, 33 (17.7 per cent) had experienced a spontaneous abortion or stillbirth at least once before. The average length of the last birth interval, defined as the interval between two pregnancy outcomes, irrespective of the outcome (thus either a live birth, a spontaneous abortion, or a stillbirth) is 30.4 months.

The total number of children born alive to all women, up to the birth from this pregnancy, is 333 (see Table 5.3) of whom 41 (12.3 per cent) died. Of the children who died, 33 (80.5 per cent) died before they were one year old. In order to estimate infant mortality and taking into account only those children born alive at least one year before the current pregnancy started (N=309), 10.7 per cent of the children born alive died in the first year of life. Comparing these figures with the rural infant mortality rates at national and state level (see Table 3.1), 89 and 98 per 1,000 live births respectively, it is evident that infant mortality in the study population is higher than the national rate.

The causes of death of the children, as perceived by the respondents, vary. For 13 of the 41 deaths, the cause of death was unknown. Remarkable is the relatively high percentage of deaths due to congenital malformations (8 of the 33 children who died in the first year) like spina bifida, hydrocephalus, and malformations of the extremities.

The mean age at marriage is estimated to be 14.5 years. This figure includes child marriages which are usually conducted at a young age. Consummation of these child marriages takes place only after the girl has reached maturity. Therefore, instead of age at marriage it is better to estimate age at consummation of marriage. Of all women, 19.9 per cent married before having reached maturity, their age at marriage ranging from 3 to 16 years old. These women started to live with their husband after having reached maturity, although not immediately: the average period between maturity and consummation of marriage is 1.3 years. The mean age at consummation of marriage for these women is 15.0 years and for the whole sample 15.7 years. The average duration of marriage (since consummation) for the whole group is 6.8 years.

Table 5.3. Number of children born alive and number of children who died

	N
Number of children born alive to respondents	333
Number of children born alive, at least one year before the current pregnancy started	309
Number of children born alive who died	41
Number of children born alive who died in first year of life	33

Although child marriages are predominantly concluded between kinsmen, inter-kin marriages are also quite common among the other women (see Table 5.4). Data could be collected for all but one village. Of the respondents in the other villages (N=149), 56.4 per cent are not married to a kin member and are, as the villagers call them, new relationships. In addition, 43.6 per cent have a kin relationship with the husband. Most of these marriages are concluded between cross-cousins (26.8 per cent), either on father's side (a woman marrying her father's sister's son: *sooder atte maga*) or on mother's side (a woman marrying her mother's brother's son: *sooder maava maga*). Another 12.7 per cent are maternal uncle-niece marriages (a woman marrying her mother's brother: *sooder maava*). Only one case of a parallel cousin marriage among the Muslims is observed.

5.1.3. Individual characteristics: prepregnancy weight-for-height status

Besides the reproductive pattern, another individual characteristic in force before pregnancy starts is weight-for-height status (see Figure 2.7). In the analysis of the effects of energy intake during pregnancy on maternal weight gain and birth weight of children this is one of the most important intervening factors. Data on prepregnancy weight and height was measured for 118 respondents only (see Chapter 6).

Women in the study population are short: on average 151 ($\pm$ 5.5) centimetres. The average prepregnancy weight of the respondents is 41 kg. ($\pm$ 4.6). The frequency distribution of women according to prepregnancy weight and height is presented in Table 5.5.

Relating height to prepregnancy-weight by estimating the Body Mass Index (BMI = prepregnancy weight (kg.) /height^2 (centimetres * 100) women are subsequently classified into groups of Chronic Energy Deficiency (see also James *et al.*, 1988; Ferro-Luzzi *et al.*, 1992; Kusin *et al.*, 1992). A high percentage of the respondents appears to be chronically malnourished: 13:0 per cent severely (BMI $\leq$ 16.0), 18.3 per cent moderately (16.0 $<$ BMI $\geq$ 16.9) and 27.8 per cent mildly (16.9 $<$ BMI $\geq$ 18.5) while 40.9 per cent of the women is non-CED (see Table 5.6).

Table 5.4. Number and percentage of women according to kin relationship between husband and wife

	N		%	
'New' marriages / no kin relationship	84		56.4	
Inter-kin marriages	65		43.6	
- Maternal uncle-niece marriage		19		12.7
- Cross-cousin maternal		13		8.7
paternal		27		18.1
- Parallel cousin		1		0.7
- Any other kin relationship		5		3.4
NS	37			
Total	186		100.0	

Table 5.5. Number and percentage of women by prepregnancy weight and height

Prepregnant weight (kg)	Height (cm)					Total	
	<145	145-149	150-154	155-159	≥160		
< 36	5	3	6	1		15	13.0%
36-37	1	6	6			13	11.3%
38-41	9	13	12	7		41	35.7%
42-44	1	6	9	6	2	24	20.9%
45-49	1	2	6	6	2	17	14.8%
≥50		1		3	1	5	4.3%
NS						3	
Total N	17	31	39	23	5	118	
%	14.8	27.0	33.9	20.0	4.3		

Table 5.6. Number and percentage of women in different groups of Chronic Energy Deficiency (CED), measured by Body Mass Index (BMI)

CED	Severe	Moderate	Mild	No CED	NS	Total
BMI	≤ 16.0	≥ 16.1 ≤ 16.9	≥ 17.0 ≤ 18.4	≥ 18.5		
N	15	21	32	47	3	118
	13.0%	18.3%	27.8%	40.9%		100%

These four groups of CED do not significantly differ in age and parity (see Table 5.7): the average age for the four groups fluctuates around 22 years, average parity around two. However, there is a difference, although not statistically significant, in birth intervals: women who are mildly malnourished experience the longest birth interval while well-nourished, non-CED women have the shortest birth interval of all. But there is a wide variation in this group, one respondent reporting a birth interval of 115 months.

5.1.4. Socio-economic characteristics

Apart from their relevance for the analysis, it is important to describe the social and economic characteristics of the study population in order to know whether it reflects the total population (see Chapter 4). Religion and caste group, the type of family a woman lives in and socio-economic status of the household are discussed here. In addition, we discuss the level of education of the respondents.

Table 5.7. Age, parity and length of last birth interval for different groups of Chronic Energy Deficiency (CED), measured by Body Mass Index (BMI)

CED	Severe	Moderate	Mild	No CED
BMI	≤ 16.0	≥ 16.1 ≤ 16.9	≥ 17.0 ≤ 18.4	≥ 18.5
Average age (in years)	22.2 ± 3.6	22.7 ± 5.0	22.6 ± 4.2	22.7 ± 5.0
Parity	2.0 ± 0.9	2.2 ± 1.6	1.6 ± 1.5	1.7 ± 1.2
Average length of last birth interval (in months)	29.6 ± 12.3	27.4 ± 8.9	35.9 ± 25.7	26.3 ± 12.1

The study population reflects the religious composition of the total population (see Subsection 4.5.1). The majority (86.0 per cent) adheres to the Hindu religion and 10.2 per cent (N=19) to the Islam. Six women belong to the tribal group of Gouli and only one woman is Christian (see Table 5.8).

In respect of the different caste groups within Hinduism too, the study population resembles the total population. Maratha and Lingayat constitute almost half of the population: 52 women (28 per cent) belong to Maratha, 38 (20.4 per cent) to Lingayat. All other castes (as mentioned in Chapter 4), except Kumbar and Madiwalar are present in this sample. A Brahmin woman who was included in the study population unfortunately had a spontaneous abortion and her participation in the research project had to be cancelled. The distribution of women per caste group and village is represented in Table 5.9.

Table 5.8. Religious composition of the study population

	Religion				
	Hindu	Islam	Gouli	Christian	Total
N	160	19	6	1	186
%	86.0	10.2	3.2	0.5	100

Table 5.9. Caste composition of the study population by village

Groups	Total N	Total %	Mugad N	Mandihal N	W.Nagalavi N	G.Nagalavi N	Ramapur N	Veerapur N	Kallapur N	Devarhubli N	Lalgatti N	Devageri N	Holtikoti N	T.Ramachandran N	Mavinkoppa N
Maratha	52	28.0	1	3			3	15	5	6	3	5	8		3
Lingayat	38	20.4	10	6			1	2	2	8	1	1	5		2
Jain	10	5.4	5		1				2	2					
Madiga	9	4.8	5	2						2					
Panchal	8	4.3		2			3	2					1		
Kurbar	8	4.3	1	2			2		2						1
Vodda	8	4.3	6			1							1		
Walmiki	7	3.9	1	1			2	1		2					
Bovi	5	2.7	5												
Kshatriya	3	1.6			1		1			1					
Hadpad	3	1.6		3											
Uppar	2	1.1	1	1											
Korama	2	1.1							2						
Madar	1	0.5													2
Mahar	1	0.5													
Ambiga	1	0.5	1												
Other	2	1.1	2												
Muslim	19	10.2	9		1					3		3			3
Gouli	6	3.2												6	
Christian	1	0.5	1												
Total N	186	100.0	48	20	3	1	12	20	13	24	4	9	15	6	11
%			25.8	10.8	1.6	0.5	6.5	10.8	7.0	12.9	2.1	4.8	8.1	3.2	5.9

For the type of household and family the respondents live in, the division discussed in Chapter 4 is applied. Most women (80.3 per cent) live in a single household (see Table 5.10). Only 17.5 per cent of the women live in a single household and nuclear family while most of these single households are composed of joint families. In this second group, vertical and horizontal joint families are distinguished. In the first type of joint family, a woman and her husband live with an older generation represented by at least one parent. In the study population, most joint families (123 out of 132, thus 93.2 per cent) are vertical. In the second, no older generation is present and husband and wife live with (married) brothers, their wives, and children. Only nine households belong to this category. The distinction might be important because of the influence of parents-in-law, and especially the mother-in-law, on food behaviour of women during pregnancy. Four women in the sample live with their own parents: their husbands had moved to their place after marriage (uxorilocal).

Regarding the economic status of the households, a wide range from very poor to very rich women are included in the sample. Estimated income ranges from only 900 to more than 50,000 rupees per year. The majority, however, are poor: more than 30 per cent of the households earn less than 3,000 rs. per year, more than half less than 5,000 rs. With regard to the primary source of income, more than one third (34.4 per cent) of the pregnant women live in households which are predominantly engaged in agricultural activities only. Another 28.5 per cent are primarily engaged in agriculture and depend on wage labour as a secondary source. In addition, 21 per cent of the households are engaged in wage labour only. Other sources of income consist of merchandise, carpentry, blacksmith, tailoring, basketry, fish work, and services. Of all households, 73.2 per cent hold some land either privately owned, leased-in, or occupied forest land. The acreage cultivated varies widely, from 0.1 to 30 acres.

Table 5.10. Number and percentage of women by type of household and family

Type of household and family			N	%
Single household			147	80.3
	nuclear family		32	17.5
	joint family	vertical	102	55.7
		horizontal	9	4.9
		uxorilocal	4	2.2
Co-residing household			36	19.7
	nuclear family		19	10.4
	joint family	vertical	17	9.3
NS			3	
Total			186	100.0

In order to formulate an index for socio-economic status to be used in the analysis, the following criteria were selected: income per member of the household, number of acres cultivated and irrigated, number of bullocks, cows, and buffaloes owned by the household, possessions of the household like a radio and bike, and presence of electricity. To estimate to what extent these different socio-economic criteria are related, a factor analysis was conducted. Three independent factors were found with an eigenvalue > 1, explaining 58.3 per cent of the variance. The factor loadings, after Varimax rotation, are presented in Table 5.11.

The number of acres cultivated and irrigated, the number of bullocks, and income per member of the household appeared to be strongly connected: these variables were loaded on the first factor which explains 30.8 per cent of the variance. The criteria 'cow', 'buffalo', and 'bullock' loaded on the second factor, explaining 16.1 per cent of the variance. However, the loadings on the last variables are low. On the third factor, explaining 11.4 per cent of the variance, we found the criteria 'electricity', 'bike', and 'radio'. This factor probably explains differences between households in the lower socio-economic stratum.

These results show that the main differences between socio-economic groups are indicated by the number of acres cultivated and irrigated, the number of bullocks, and income per member of the household. Not surprising, as the majority of the study population are engaged in agricultural activities, either cultivation of own land or agricultural wage labour. Therefore, in order to construct the index of socio-economic status of households these four indicators are selected. Applying a reliability analysis, we found that these four create a reasonably reliable index for socio-economic status (standardized $\alpha = .75$). Subsequently, for each respondent a summed Z-score over these four variables was estimated (distribution ranging from -0.78 to 4.16) and four classes of socio-economic status were discerned: the lower class, lower-middle class, middle class, and higher class. Households in the lower class do not possess land or bullocks and are dependent on wage labour only, which implies an average low income of 3,000 rs. An example of one of the higher class households is one which

Table 5.11. Factor structure of socio-economic indicators after Varimax rotation

	Factor I	Factor II	Factor III
Number of acres cultivated	.79		
Number of acres irrigated	.75		
Number of cows		.81	
Number of buffaloes		.44	
Number of bullocks	.64	.53	
Electricity	.44		.56
Bike			.64
Radio			.73
Income per member of the household	.66		
% variance explained:			
Total: 58.3	30.8	16.1	11.4

cultivates fifteen acres of land, of which ten acres wet land, owns six bullocks, and has an estimated average income of 40,000 rs per year. The lower-middle and middle classes are situated in between.

A strong relationship is found between socio-economic status of the household and type of family (see Table 5.12). Of all nuclear families (N=51), more than 60.0 per cent (N=33) belong to the lower socio-economic class. Only one household in the higher socio-economic class lives in a nuclear family. Not all households in the lower class, however, live in a nuclear family: 45.0 per cent (N=27) actually lives in a joint family. But, compared with the three other social classes, this percentage is quite low. While in the lower-middle class the percentage of households living in a joint family amounts to 80.0, in the two higher class percentages of 90.0 and 95.0 are observed respectively.

As can be seen in Table 5.13 the level of literacy among the study population is very low. Most women (81.9 per cent) had not received any formal education at all. Of those who had (N=33), over half (N=18) completed only standard four or lower. The highest educated women are the two who finished college (bachelor's degree). Another followed a special teaching course. Remarkably, two-thirds of the women with education reached a higher level than their husbands did. This finding is not in accordance with the reported norm of hypergamy (marrying a husband who has higher socio-economic status and also higher education; see also Chapter 4) generally reported to be applied among the educated classes in the cities.

Table 5.12. Number and percentage of women by socio-economic class and type of family

Socio-economic class	Type of family							
	Nuclear		Joint		NS	Total		
Lower class	33	66.0%	27	20.8%		60		
	55.0%		45.0%				100%	
Lower-middle class	12	24.0%	48	36.9%		60		
	20.0%		80.0%				100%	
Middle class	4	8.0%	36	27.7%		40		
	10.0%		90.0%				100%	
Higher class	1	2.0%	19	14.6%		20		
	5.0%		95.0%				100%	
NS	1		2		3	6		
Total	51	100.0%	132	100.0%	3	186		

Table 5.13. Number and percentage of women by highest level of education attained

Highest level of education obtained	N	
No education at all	149	(81.9%)
< standard four (P4)	5	
Standard four completed (P4)	13	
< standard seven (P4 < > P7)	4	
Standard seven completed (P7)	4	
Secondary school incomplete	1	
Secondary school leaving certificate (SSLC)	3	
Teacher's course	1	
College complete (bachelors)	2	
NS	4	
Total	186	

5.2. Characteristics prevalent during pregnancy: antenatal care

In the former subsection we discussed the demographic and socio-economic characteristics of the respondents before pregnancy started and in this section we focus on characteristics prevalent during pregnancy. As the former factors constituted the starting position for the child, the variables discussed in this section affect the well-being, growth and development of the fetus, and the health condition of mothers as well. First we discuss utilization of antenatal health care provided by the formal health system. Topics discussed are the use of antenatal services in general (Subsection 5.2.1) and the compliance with tetanus injections, iron and folic acid tablets (Subsection 5.2.2), and food supplementation during pregnancy (Subsection 5.2.3). In addition, we discuss the prevalence of anaemia and other perceived illnesses in the study population (Subsection 5.2.4).

5.2.1. Use of antenatal health services

All but three women reported they had received antenatal check-ups. 34.1 per cent were examined by the local nurse only. Most of the women (64.2 per cent), however, also paid at least one visit to a hospital or private doctor in one of the nearby cities. Most women went only once to check that everything was alright.

This percentage of antenatal health services users is surprisingly high compared with figures cited in literature (Jagdish *et al.*, 1983; Mathai, 1989; UNICEF, 1991). Examining different background variables which are possibly related to utilization of antenatal services, the following results were found. Our expectation that attendance of antenatal provisions in the cities would differ between the villages, as the distance to these provisions varies, was not confirmed. Women living in the more remote cluster of villages also visit private doctors or hospitals in nearby towns. In addition, women with higher education indeed pay more visits, but the difference with other women is not significant. Neither were significant differences found for socio-economic status although in the higher social class more women (75.0 per

cent) use antenatal services provided in nearby towns than women in the lowest class (57.9 per cent) (Table 5.14). In the lower social class, a significant difference in use of antenatal services was found between types of family.

The difference in parity, however, is significant: zero parity women attend health services more frequently than higher parity women (see Table 5.15). In the first group, 81.6 per cent went to either a hospital or a private doctor. Higher parity women often remarked that they already have experience enough, as the case study of S. illustrates:

"I did not go to the hospital. It's already my third pregnancy, no, so I know it by now".

A significant difference in use of antenatal services in hospitals and private doctors also exists between the different types of family. Women living in joint families attend health services more often (69.9 per cent) than those living in nuclear families (51.0 per cent) (see Table 5.15). This relationship can be explained by the confounding effects of parity and socio-economic status. Almost all zero parity women live in a joint family while higher parity women relatively more often live in a nuclear family (see Table 5.15). Also joint families are more often found in the higher socio-economic classes (see Subsection 5.1.3) where women visit antenatal services more often.

5.2.2. Compliance with tetanus injections and iron tablets

All but five women reported they had received tetanus injections during pregnancy. The injections were given either by the local nurse, or in a hospital, or private clinic in the cities. Not all women, however, appeared to have received the recommended number of three injections: 55.2 per cent of the women received two injections, another 29.7 per cent only one.

The five women who did not receive tetanus injections (or iron tablets) are all of higher parity. As they explained, after previous pregnancies the local nurse (who has to reach sterilization targets, see Chapter 4) wanted them to have an 'operation'. As they refused to cooperate, during the next pregnancies they did not receive the usual antenatal care from her.

Table 5.14. Number and percentage of women using antenatal health services in nearby towns by socio-economic class

Socio-economic class	Use of antenatal services			
	No use or local nurse only	Hospital or private clinic in nearby towns	NS	Total
Lower	24	33 (57.9%)	3	60
Middle low	21	36 (63.2%)	3	60
Middle	12	25 (67.6%)	3	40
Higher	5	15 (75.0%)		20
NS	1	4	1	6
Total	63	113 (64.2%)	10	186

Table 5.15. Number and percentage of women using antenatal services in hospitals and clinics in nearby towns by type of family and parity

	Type of family				NS	Total		
	Nuclear		Joint					
Parity	Users	Total	Users	Total		Users		Total
0	1	3	30	39	4	31	81.6%	42
1	3	7	19	32	2	22	59.5%	39
2	9	17	24	37	2	34	64.2%	55
3	8	15	7	11		15	55.6%	27
4	4	5	6	10	1	10	66.7%	15
5+	1	4		3		1	14.3%	7
NS					1			1
Total	26	51.0% 51	86	69.9% 132	10	113	64.2%	186

On asking women who received the iron tablets whether they actually took them, they confirmed this initially. However, in the in-depth interviews it became clear that most women did not really take these red tablets, or tonic tablets as they are called by the villagers. Of all the women, 28 (15.0 per cent) stated they took the tablets and a small proportion (N=12) swallowed some of the tablets given, often only half. However, the majority (almost 80.0 per cent) of the women did not take the tablets at all and said they just threw the tablets away.

This high percentage of non-compliance is related to perceptions regarding the effects of the tablets. Most (90.0 per cent) of the women who did not take the iron tablets stated that they would lead to a big child which would cause problems in labour. Not only fear of pain plays a role here, economic reasons are important as well. Respondents said that if the child is too big, they would have to go to the hospital for a caesarean which would require a lot of money.

One of the younger birth attendants (see also Chapter 8) mentioned that it is quite logical that women associate the tablets with the health of the child and not with their own health. She mentions: "they reason: if these tablets are only given to women who are pregnant it should be meant for the child".

Although most of the women mentioned this perceived consequence of taking iron tablets, a small number (N=5) mentioned other reasons as well. One of these other perceptions was related to the concepts of heating and cooling known in Ayurveda (see Chapter 4): tonic tablets are reported not to be taken because they are heating. Drinking milk, which has a cooling effect, while taking the tablets is considered to be necessary. But milk is often not available in the household. In addition, the intake of iron tablets is associated with contraceptives as strips with the oral pill contain twenty-one contraceptives and seven iron tablets (see Chapter 4).

But ... there is more. Women who visited a hospital or a private doctor during pregnancy, and who did not swallow the tablets given by the nurse, did take the same iron tablets when prescribed by the doctors. These tablets, bought in a pharmacy, are nicely packed, while the iron tablets given by the local nurses are given by hand and often give off colour in rainy and warm weather. In addition, the person prescribing the tablets has much more social status than the local nurse. But above all, respondents pay for these tablets while the others are given free. As the mother of one of the pregnant women mentioned when we asked why they took the tablets prescribed by a private doctor in Dharwad, and not the ones given by the health worker:

"but for those tablets we did pay. So that is why we take them".

However, although these tablets are taken more often, it is still quite common to buy and consume only half the number.

5.2.3. Compliance with food supplementation

When questioned whether they were selected to receive food supplementation during pregnancy, the majority of the women responded negatively. Women selected to participate in the programme (N=29), did not always participate. A few women (N=2) mentioned they were selected but did not go to collect the food from the *anganwadi*. They felt ashamed to go there while the whole village watched them: they would openly admit to being poor. In most villages therefore, usually children attending the *anganwadi* bring the *tiffin* home. Sometimes, too, only the powder is provided, but this is rather an exception as it does not guarantee consumption by the pregnant woman herself.

Even if the *tiffin* is provided at home, the proportion of women who actually eat the food is low. Only seven out of twenty-nine women ate the extra food without any restriction. Others ate the food only now and then. Some respondents (N=5) indeed received the food, but used it as a substitution rather than a supplementation. If they ate the tiffin, they skipped another meal. Others (N=12) reported that they received the food but did not eat it. They either did not like the taste, or gave the *uppittu* to the children.

Women mentioned that they received the supplementation at such a time that the *tiffin* was cold and no longer tasty. Supplementary food is prepared early in the morning and when the children bring it home at the end of the morning it has cooled down. Good food in India is supposed to be fresh, i.e. just prepared hot food. If women work in the fields and come home late in the afternoon it is certainly no longer tasty. The fact that the *tiffin* is cold by the time women receive it is even more a constraint after delivery, as this is considered to be a period in which all cold foods should be avoided (see Chapter 8).

5.2.4. Prevalence of anaemia and other illnesses

Data gathered in the fieldwork regarding morbidity during pregnancy are incomplete and the information available consists predominantly of feelings of well-being as perceived by the respondents. A few of these perceived illnesses are mentioned here. Quite a number of respondents (N=25) complained about general feelings of weakness during pregnancy. Another number (N=19) mentioned they had problems like colds and coughs. At least three women were known to have oedema. And another group of women (N=25) mentioned they had

problems related to pregnancy like stomach ache, breathlessness, a burning sensation in the body, and acidity. These last problems are discussed in detail in Chapter 7, as they are believed to be related to food intake during pregnancy.

More information is available on the prevalence of anaemia in the study population. As mentioned in Chapter 3, the Hb-level was measured in the last trimester of pregnancy. The percentage of women experiencing an Hb-level of ≤ 11.0 gr/dl (which is the cut-off-point for anaemia used by for example UNICEF in India) in the last trimester of pregnancy amounts to 62.3 per cent. A smaller percentage, 18.5, is severely anaemic (≤ 10.0 gr/dl).

5.3. Characteristics prevalent during pregnancy: customs and practices

Having discussed antenatal care, in this section we focus on customs and practices during pregnancy, like (dis)continuation of breastfeeding during pregnancy and the custom of delivering in the house of the pregnant woman's parents. In addition, daily activities conducted during pregnancy are described.

5.3.1. Breastfeeding

As we were acquainted with the general rule existing in many developing societies and also in India (Jeffery *et al.*, 1991, p. 77) to stop breastfeeding the youngest child as soon as another pregnancy starts, we did not expect women to breastfeed during pregnancy. Our actual observation was that some women do continue breastfeeding. Of all not-zero parity women in the study population (N=144), 54.8 per cent stated that they did not breastfeed their children during pregnancy. Some of these women had already weaned their child long before conception, others stopped the moment they discovered they were pregnant. The main reason to stop was the negative effect of the milk on the health of the suckling: the child would suffer from stomach pains.

Another 37.5 per cent (N=54) of all multiparae stated they continued breastfeeding during pregnancy. The average length of the period of lactation was six months of pregnancy. Fourteen women continued breastfeeding until the last month and some continued even after delivery, thus breastfeeding two children at the same time as the following case study illustrates.

CASE STUDY

Y. discovered she was pregnant when her youngest child, a boy, was only three months old. During her pregnancy, she continued breastfeeding the child. She felt he was too small to be weaned. After nine months, she gave birth to a very small girl. Her weight was only 1,850 grammes and everyone expected her to live a short life. When Y. saw that the girl was very weak, she gave preference to the first child and offered most breastmilk to him. The girl managed to survive for some months, but finally died.

One may wonder whether the same would have happened if the first born child had been a girl and the observed birth a boy.

In general, women continued breastfeeding because they felt their youngest child was still too young to be weaned. The average last birth interval of women continuing breastfeeding is 26.9 months which is slightly shorter than the average of 30.4 months. Women breastfeeding up to nine months of pregnancy (N=14) had an average last birth interval of 21.6 months.

Over half the women breastfeeding while pregnant stopped in month six. The reasons given vary widely. Most important was the perception that the milk would negatively influence the health of the youngest child. Others said it would affect both children: the child last born and the foetus. Only very few women (N=2) said it would affect their own health. The teeth of the youngest child hurting the breasts was another argument to stop.

Women deciding to discontinue breastfeeding, use different weaning methods. Either a mixture made of betelnut-leaves (*yeele*) mixed with salt and neem leaves (*beevu*) or a mixture made of fruit from the forest (*gadjiga*) are applied to the breasts in order to discourage the child from drinking.

We wonder whether lactation during pregnancy does affect the health of the mother or that of the foetus. Does the mother not need more energy during pregnancy? As one of the respondents remarked:

"she has to feed three people: herself, her last child and the child in the stomach".

Research by Merchant *et al.* (1990a and 1990b) among rural Guatemalan women indicates that the extra energy demand of lactation during pregnancy is compensated by a higher energy intake and reduction in maternal fat reserves, whereas fetal growth is not affected.

*5.3.2. Going to the mother's place (**tavaru mane**)*

Of the 186 women, 68.3 per cent (N=127) left their husband's family in order to deliver in their mother's place (*tavaru mane*). For a number of women (N=13) this meant moving from one house to another in the same village, but most migrated to other villages in the area. The four women who live in a uxorilocal family, and thus with their own family, of course stayed at home for delivery.

In the literature only first gravida women are reported to move to their mother's place for delivery. However, in our sample we observed that women of higher parity also leave (see Table 5.16). Of all zero parity women, 95.2 per cent (40 out of 42) left. Of the two women who did not leave, one lives in a uxorilocal family and the other had a stillbirth before she could have left. Of first and second parity women, 71.8 (28 out of 39) and 72.2 per cent (39 out of 54) left respectively. At parity three and four, the proportions decline slightly but still include almost 50.0 per cent of the women (13 out of 26 and 7 out of 15 respectively). Some women (especially women of parity zero and one) left already in month seven of pregnancy but the majority left in month eight or nine.

Table 5.16. Number and percentage of women who left for their mother's house in order to deliver, by kind of family and parity

Parity	Type of family: Nuclear			Type of family: Joint			NS	Total		
	Left for parents' place		Total	Left for parents' place		Total		Left for parents' place		Total
0	3		3	37		39		40	95.2%	42
1	5		7	23		32		28	71.8%	39
2	12		17	26		37	1	39	72.2%	55
3	7		15	5		11	1	13	50.0%	27
4	3		5	4		10		7	46.7%	15
5+			4			3				7
NS							1			1
Total	30	58.8%	51	95	73.6%	132	3	127	68.3%	186

Women living in joint families more often went (73.6 per cent) to their parents' house for delivery than those living in nuclear families (58.8 per cent). This is partly related to the fact, already mentioned before, that most first parity women live in joint families. But also, for women living in nuclear families it is more difficult to leave their husband's house as no other family members are around to keep the household. The custom of going to the mother's house is practised by all religious groups of Hindu, Muslim, Christian, and Gouli (see Table 5.17) and by all different caste groups as well. In all four different socio-economic classes women leave for their parents' place.

The custom of 'going to the mother's place' has different functions. First of all, a woman gets more rest, more care, and often better food in her parents' place. In her husband's house she usually has to work hard, whereas here she is allowed to rest. Women mentioned they received better food in their mother's place: they felt more free to go to the kitchen and prepare some food, and to ask their family members to bring something special from the market place. Certainly, women are much more at ease with their own family. The differences were obvious to us when meeting women in both their husband's and their parents' place.

The custom also serves social objectives. Each daughter must be taken care of during her first pregnancy and delivery: this is a duty still to be conducted by her own family. After marriage and the ceremony conducted during the first pregnancy (*kubasa*, see Chapter 4), this is a next step in the transition process from her father's family to her husband's. After delivery of the first child, when the woman returns to her husband's place, her parents send some presents or money with her. The kind of presents given not only depend on economic circumstances of the household but also on the sex of the child. For example, one of the families, situated in the middle socio-economic class, sent their daughter and her first son with an amount of 2,000 rs. (120 guilders) meant for the child, some clothes, and a silver waist belt.

Table 5.17. Number and percentage of women who left for their mother's house to deliver, by religion and socio-economic class

	Left for mother's place?			NS	Total
	No	Yes			
Religion					
Hindu	47	113	(70.6%)		160
Muslim	8	11	(57.9%)		19
Christian		1			1
Gouli	4	2	(33.3%)		6
Socio-economic class					
Lower	24	36	(60.0%)		60
Lower-middle	18	42	(70.0%)		60
Middle	9	31	(77.5%)		40
Higher	6	14	(70.0%)		20
NS	2	4			6
Total	59	127	(68.3%)		186

If a woman leaves for her parents' house to deliver, her parents are responsible for the costs of delivery. Sometimes, especially if the woman is of higher parity, these costs are a problem as the following case study illustrates.

CASE STUDY

L. was pregnant with her fourth child. She gave birth to the other three children at her parents' place and she wanted to deliver there again. However, there was an argument between her parents and her husband's family, the central issue being 'who will pay the costs of delivery for this fourth child?' L. was certainly welcome in her parents' house, but only if her husband agreed to pay all extra costs included. As he ultimately did.

Some months after delivery women return to their husband's place. Ideally, they stay for five months at their *tavaru mane* and zero parity women indeed do so. In the sample, most women returned within three or five months after delivery. (Rules exist regarding when a woman can return: within one, three, five, or nine months after delivery). Circumstances also determine when a woman returns to her husband's house. The absence of another woman to take care of the work in the house of her husband, as in nuclear families, made some women return earlier. And, although it was never really mentioned, we got the impression that if the child was a girl, the mother returned earlier.

5.3.3. *Daily physical activities*

In the analysis on the effects of food intake during pregnancy, energy expenditure determined by daily physical activities is an important variable (see Chapter 2). As mentioned in the former subsection, in her mother's place a woman can take more rest, while in her husband's place she usually has to work hard. We shall take a closer look at these daily activities conducted in the husband's place.

Using the classification formulated by the ICMR (1991), i.e. sedentary, moderate, or heavy work, we classified women according to the type of activity conducted and duration (in months of pregnancy). The following categories are distinguished:

1. Women whose daily activities are light or sedentary and consist of:
   a. housekeeping only;
   b. housekeeping plus wage labour at home, like making leafplates or mats and brooms;
   c. housekeeping plus fieldwork up to month four of the pregnancy.
2. Women whose daily activities are moderate and consist of:
   a. housekeeping plus working in the fields, longer than month four of the pregnancy;
   b. housekeeping plus wage labour (except activities mentioned under 1.b).
3. Women whose daily activities are heavy and consist of:
   a. housekeeping plus work like *gavandi* work (building industry) or work in the stone quarry.

In the study population, 45 (26.8 per cent) women were engaged in housekeeping only throughout pregnancy (see Table 5.18) while five others were engaged in an economic activity at home: they made mats and brooms (like the Korama in Kallapur), kept a shop, or did tailoring work. Others (N=5) in this first category went to the fields, but stopped working before four months of pregnancy.

The majority of all women (64.9 per cent), however, worked outside the house for a longer period of pregnancy. In this second category, women conducting agricultural work in the

Table 5.18. Number and percentage of women by type of activity conducted during pregnancy

Type of activity conducted	N	%
1. Housekeeping only Housekeeping plus work at home Housekeeping plus fieldwork < 4 months of pregnancy	55	32.7%
2. Housekeeping plus fieldwork ≥ 4 months of pregnancy Housekeeping plus other work outside	109	64.9%
3. Housekeeping plus heavy work like stonecrushers	4	2.4%
NS	18	
Total	186	

fields, either cultivating their own fields, or working as wage labourer are included (N=94). But also the twelve women who conducted any wage labour: in agriculture or in the nursery in Holtikoti (see Chapter 4). A few women (N=3) had jobs as a teacher or research assistant.

Only four women were engaged in heavy work, like daily work in the stone quarries or the building industry (*gavandi*). The three women working in the stone quarry live in the village of Mandihal while the *gavandi* worker lives in Holtikoti (see Table 5.19). In the latter village, and in Mugad, Devarhubli, and Veerapur as well, relatively more women are engaged in work outside the house.

Most of the women engaged in activities outside their home (91.2 per cent), worked to longer than six months of pregnancy. 30.4 per cent worked to the last month. Work in the fields is in accordance with various seasonal agricultural operations. In the rainy season, women do the weeding and in the following months the harvesting. Circumstances in the household determine whether a woman works in the fields during her pregnancy or not. In a nuclear family, a mother with small children cannot go to the fields if there is no one to look after the children. On the other hand, for many poor women, (wage labour) work is a necessity for survival. For these women, working in the fields has another connotation than for those cultivating their own land. This latter group considers fieldwork more pleasant than keeping the house: going to the fields means more freedom. Especially in the weeding season, when women go in small groups together to the fields, one day weeding one's field and the next day the other's, it is more fun to go to the fields. They have contact with other women, can talk and gossip.

Table 5.19. Number and percentage of women engaged by type of activity and village

Village	Activity conducted			NS	Total
	Housekeeping only	Housekeeping + work outside	Housekeeping + heavy work		
Mugad	13	29		6	48
Mandihal	7	8	3	2	20
W.Nagalavi	1	2			3
S.Nagalavi					
G.Nagalavi		1			1
Ramapur	5	5		2	12
Veerapur	5	13		2	20
Kallapur	5	8			13
Devarhubli	8	16			24
Lalgatti		3		1	4
Devageri	1	4		4	9
Holtikoti	2	12	1		15
T.Ramachandran	3	3			6
Mavinkoppa	5	5		1	11
Total	55 (32.7%)	109 (64.9%)	4 (2.4%)	18	186

Table 5.20 summarizes these background variables related to engagement in economic activities. Joint and nuclear families do not differ in the type of activities conducted during pregnancy. Zero parity women are relatively less engaged in housekeeping only and conduct more work outside, mostly in the fields. First and second parity women, having small children at home, have the highest percentage of women engaged in housekeeping only. Looking at socio-economic status of the household, heavy work is conducted by women from the lowest economic classes. In general, working is believed to be good during pregnancy. Many respondents mentioned that if women work during pregnancy their delivery will be easier.

Table 5.20. Number and percentage of women by type of activity, type of family, parity, and socio-economic status

	Activity conducted			NS	Total
	Housekeeping only	Housekeeping + work outside	Housekeeping + heavy work		
Type of family					
Nuclear	15 (30.6%)	32 (65.3%)	2 (4.1%)	2	51 (100%)
Joint	40 (33.6%)	77 (64.7%)	2 (1.7%)	13	132 (100%)
NS				3	3
Parity					
0	5 (13.9%)	29 (80.6%)	2 (5.5%)	6	42 (100%)
1	17 (48.6%)	18 (51.4%)		4	39 (100%)
2	20 (40.0%)	30 (60.0%)		5	55 (100%)
3	7 (26.9%)	18 (69.2%)	1 (3.9%)	1	27 (100%)
4	3 (21.5%)	10 (71.4%)	1 (7.1%)	1	15 (100%)
5+	3 (42.9%)	4 (57.1%)			7 (100%)
NS				1	
Socio-economic class					
Lower	18 (34.0%)	32 (60.4%)	3 (5.6%)	7	60
Lower-middle	19 (33.3%)	37 (64.9%)	1 (1.8%)	3	60
Middle	13 (36.1%)	23 (63.9%)		4	40
Higher	5 (25.0%)	15 (75.0%)		20	
NS				6	
Total	55 (32.7%)	109 (64.9%)	4 (2.4%)	18	186 (100%)

To get an idea of activities conducted on a normal day, several women were followed and their activities observed during one day. Four of these case studies, all dealing with different economic activities, are presented in appendix A. For all four, background variables related to the type of economic activity conducted like caste group, economic status of the household, and the month of the year in which observation took place, are described. In the first case study, the activities of a woman living in the middle socio-economic class who kept house only during her whole pregnancy are described. The case study gives a good idea of all types of activities carried out in keeping house, caring for children, and preparing food. The second case study illustrates the work conducted by a woman of the Korama, the caste group engaged in making mats and brooms. This woman is in the socio-economic lower-middle class. The case study shows how housekeeping and economic work are combined. In both case studies, women live in a joint family, and part of the housekeeping is conducted by other female members as well. The third case illustrates how a woman living in a nuclear family (middle socio-economic class) combines her housekeeping with cultivation of the land owned by her family. And the last case study deals with working activities of one of the poorer women (lowest socio-economic class) in the study population. She lives in Mandihal and goes to work in the stone quarry nearby every morning.

Besides information regarding the type of activities conducted, the four case studies also give an impression of the daily food and meal patterns and of certain foodstuffs and eatables consumed. This kind of information is described in detail in the next chapter.

5.4. Summary

Summarizing, the study population consists of 186 pregnant women living in a rural area. In general, the population can be characterized as poor: only 10.8 per cent (N=20) is relatively well-off. The majority belongs to the Hindu religion, a small percentage (10.2 per cent) to the Islam. Another small proportion (N=6) belongs to the tribal community Gouli, while one respondent only is Christian. The population has a high rate of stillbirths (51.9 per 1,000 pregnancies) and perinatal mortality (85 per 1,000 live births). Of all the women, 17.7 per cent had experienced a spontaneous abortion or stillbirth at least once before. Furthermore, the population is young: most are aged 14 to 24 years and have just started the reproductive process. Average parity is 1.8. The women married young, on average at 14.5 years. The average age at consummation of marriage is higher: 15.7 years.

Women are light and short: they weigh on average 41 kg before pregnancy while their average height is 151 cm. The percentage of Chronically Energy Deficient (CED) women, as measured by their Body Mass Index, is high: more than half of the population. Of all the women, 13.0 per cent is severely CED, 18.3 per cent moderately and 27.8 per cent mildly CED. In addition, 18.5 per cent of the women are severely anaemic (Hb-level $\leq$ 10.0 gr/dl).

In the next chapter, these background characteristics of the study population are related to energy intake during pregnancy, health condition of the mother, and pregnancy outcome.

Chapter 6 Food intake during pregnancy, the health condition of women, and well-being of the children in the first month of life [3]

In Chapter 5, we presented four case studies depicting daily activities conducted by women during pregnancy. Besides economic activities, these case studies gave a first impression of activities related to preparation and consumption of food. Here, we elaborate on this and describe the general meal pattern, availability of food items, access to food, and distribution of food within the family. Referring to the model on nutritional behaviour during pregnancy (see Figure 2.9), which is based on the value expectancy theory of Fishbein and Ajzen (1975), these factors are the constraints influencing actual food behaviour. Moreover, the information presented in Subsection 6.2.1 functions as background for the remainder of the chapter in which actual energy intake during pregnancy and its effects on the health condition of the women and the well-being of the child in the first month of life is examined.

During the feasibility study, conducted before the actual research project started (see Chapter 3), women stated that they ate less during the last trimester of pregnancy. In the actual research project, first of all we wanted to know whether women indeed do reduce their food intake (Subsection 6.2.2). In other words, women might state they lower their food intake but do they really do so and how much less do they eat? Moreover, we wonder whether the custom of reduction of food intake is practised by all pregnant women or by a particular group only (Subsection 6.2.3).

In addition, we describe the effects of energy intake during pregnancy on the health of the mother, expressed as weight gain during pregnancy (Subsection 6.3.1) and development of skinfolds and mid-upper-arm circumference (Subsection 6.3.2).

Data on effects of energy intake during pregnancy on birth weight of children are presented in Section 6.4. The literature indicates that birth weight alone is not a sufficient indicator for the well-being of the child (see Chapter 2). Several studies reported that children in developing countries show a higher growth velocity than children in industrialized countries. The difference is most obvious in the first month of life. Therefore, in this study we also discuss the development and growth of children in the first month of life (Subsection 6.4.3).

Before we start to describe the analysis of food intake during pregnancy and the effects on the health condition of the mother and the pregnancy outcome, however, some remarks about the number of observations should be made.

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[3] Data on food intake, skinfold thickness, and anaemia during pregnancy have been gathered and estimated by ms. Anupama C. Angadi (M.Sc.), ms. Revathi S. Hosamath (M.Sc.), and ms. H.K. Jayalakshmi (M.Sc.). Results are presented in Jayalakshmi and Angadi (1991), and in Angadi and Hosmath (1992).

6.1. Number of observations

We intended to measure women's food intake five times during pregnancy: in month three/four, five/six, seven, eight, and nine. However, these five observations could not be accomplished for all women in the study population (see Chapter 3). The actual number of observations in each month of pregnancy is depicted in Table 6.1.

In addition, the initial number of women included in the analysis was reduced due to the following factors. We started the nutritional survey in May 1991 by selecting two groups of women (see Chapter 3). Women who could possibly become pregnant in the forthcoming period, and women who were already pregnant but less than six months. This latter group was therefore not followed throughout the whole period of pregnancy and data on pre-pregnancy weight-for-height status and weight gain during pregnancy for this group are not available. The number of observations of these two variables is further reduced. We started to measure the weight of women in the month of May 1991 and as a consequence, the total weight gain during pregnancy could only be measured for women who had their last period in April onwards. In the same way, prepregnancy weight could only be estimated for women having their last periods in month May onwards. In this way, some of the women in the study population (N=52) were excluded from the analysis.

In addition, we left out women who either had a spontaneous abortion, whose child died immediately after delivery or who gave birth to twins (N=16). As a consequence, the total number of women included in the analysis on effects of energy intake on the health condition of the mother and pregnancy outcome is 118 (see Table 6.1).

Table 6.1. Number of observations for different variables included in the analysis

	N	Before pregnancy	Month of pregnancy					After pregnancy
			3/4	5/6	7	8	9	
All pregnant women	186							
Food intake			60	122	114	101	50	60
Pregnancy histories		118						
Prepregnancy weight		115						
Prepregnancy height		118						
Weight			112	114	100	98	84	
Skinfolds			52	87	70	68	33	
Mid-upper-arm circumference			108	114	100	96	83	
Anaemia (Hb)					70	55	29	
Birth weight								88
Weight neonates								90

Among this group of respondents, prepregnancy weight-for-height status was measured for 115 women (98%). Given the number of observations on food intake in the different months of pregnancy, estimation of change in energy intake during pregnancy was possible for 83 women (70%) only. Weight of women in month nine of pregnancy was observed for a limited number of women and as a consequence weight gain over the whole period of pregnancy could be estimated for 84 women (71%). Birth weight was observed for 88 children (75%). The longitudinal character of the study implies that a missing observation on one of the variables means other information is also lost. No imputation has been conducted. Therefore, some of the following analyses are based on a limited number of respondents (see for example Subsection 6.4.2). Results of this analysis, therefore, must be interpreted with care.

6.2. Food intake during pregnancy

In this section, we first describe the general meal pattern as it exists in the research area. Social and economic constraints to actual nutritional behaviour (see Figure 2.9) like availability and access to food and distribution of food within the family are discussed too (Subsection 6.2.1). In the next subsections, actual energy intake during pregnancy and related background factors are discussed.

6.2.1. Food pattern, availability and distribution of food

For most villagers, the daily food pattern is monotonous, consisting of the same meal pattern and the same food items. Of course, there is seasonal variation in availability of vegetables or fruit. Also, on festivals and new or full moon days special food like sweet wheat preparations (*shawige* and *shira*) are consumed. But in general, especially among the lower socio-economic groups, variation is limited. The daily meal pattern is as follows (see also the case studies in Appendix A).

Early in the morning, people drink tea with sugar. Milk is added if available and affordable. Poor man's tea is black tea. But even if buffaloes or cows are present in the household, most milk is sold to the milk cooperative, leaving only a small quantity for use in the household.

Breakfast, eaten later in the morning, consists of a snack (*tiffin*). *Upma* (*uppittu*), made of *rava* (wheat coarse) fried with onions, fresh chillis, garlic, and other spices is one of the most common *tiffins*. Others are *churmari* (puffed rice) or *avalakki* (beaten rice flakes) prepared with the same ingredients. Not everyone, however, eats a *tiffin* every morning: it depends strongly on the economic status of the household. In the nutritional survey it became clear that most women take a *tiffin* in the morning only once in three days. On the other two days, breakfast consists of part of the afternoon meal: some *rotti* and vegetables (see for example Case Study 4 in Appendix A).

In the afternoon, usually around one or two o'clock, a meal (*oota*) is consumed. This starts with *rotti* and curries made from vegetable or pulses. *Rotti* is a kind of pancake made of jowar (*joola*: sorghum) flour and water. *Chapati*, the pancake made of wheat (which is more expensive) is eaten by only a few people belonging to the higher socio-economic classes.

Vegetable curry (*bhaji*) consists of vegetables baked in oil with onions, garlic, fresh chillis, and other spices. The most commonly eaten vegetable, available almost throughout the year, is brinjal. Some other vegetables eaten in the villages are potato, ladies finger, ridgegourd, beans, leafy vegetables like fenugreek or amaranth, pumpkin, cucumber, or bell-pepper. Most vegetables are grown in the fields, very rarely in the kitchen garden at the back of the house. Most vegetables are grown and consumed in the period during and after the rainy season. In addition to season, physical and economic accessibility determine the consumption of vegetables. For example, vegetables are abundant in the village of Mavinkoppa, where they are grown in the area near the tank at walking distance from the village. In the more remote cluster of villages, however, most inhabitants are dependent on the weekly market day in Dharwad and eat fresh vegetables only three days a week. In the same way, people from the poorer sections, owning no land, simply do not have the money to buy vegetables every day. If vegetables are not available, more pulses like thurdal (*togaare beele*) or green gram (*hesaru beele*) are eaten.

After *rotti* and vegetables, the meal continues with rice with curry commonly made of thurdal. If milk is available it is added to the rice. Hot pickles (*uppinkai*), home-made from raw mango (*mavinkai*) are also served. Sometimes, especially in the hot summer season, curds (*mosaru*) or buttermilk (*majjige*) accompany the meal. Along with the food (which is eaten only with the right hand) water is taken. It is literally poured into the mouth, without the lips touching the cup. The meals are concluded with a *pan* made of betelleaves (*yeele*) with areca nut and lime (*sunna*). This is said to help digestion.

Late in the afternoon, again tea is taken. Very rarely, only on special occasions, is *tiffin* eaten in the evening time. Finally, at night around nine to ten o'clock the last daily meal, also consisting of rotti and rice and *bhaji*, is eaten.

Of all women in the study population, 31.7% (N=59) are vegetarian. Besides Jains and Lingayats, women belonging to the caste of artisans, the Panchal (carpenters and blacksmiths), are also strictly vegetarian. A few women of the Kurbar and Kshatriya communities claim to be vegetarian although others belonging to the same caste do not.

Among non-vegetarian women actual consumption of chicken, fish, or mutton is limited because it is quite expensive. Eggs are eaten more commonly. Caste groups like the Bhovi, traditionally the fishermen, eat fish more frequently.

Also consumption of fruit is low. One of the most common fruits available is banana. In the months of April and May more mangoes are eaten. When asked about the kind of fruits eaten during pregnancy, women mentioned all different kinds: *mosambi*, grapes, watermelon, jackfruit, apple, *sapota*, and *amla*. But when asked how often they ate them, it turned out to be only three or four times during the whole period of pregnancy. Moreover, the amount of fruit actually eaten is small. One woman proudly told us that her husband brought grapes from the market but she actually ate only three or four grapes herself: the others were eaten by her husband and children.

This brings us to the distribution of food within the family. The men in the household eat first. Sitting on the ground, on a blanket or a special wooden plank (*mane*), they are served by the women. If a plate is empty more food is added until the eater makes it clear that he has had enough. When the men have finished, the children eat. Only after they have finished too, do women themselves take their meals (see for example the case studies in Appendix A). They eat the food which is left over. Not all items of the meal are necessarily left, as the following case study illustrates.

CASE STUDY
B. who lives in a household of twenty eight people, says that if she gets the chance, she eats an egg once a week. But it depends, usually the men do eat first and no eggs are left for her and the other women.

In smaller households too this kind of distribution of food exists.

CASE STUDY
S. who lives in a household of four people mentions that during her whole pregnancy she ate an egg only once. Her husband eats an egg every week. S. tells this without any hard feelings: her husband also needs more food.

In addition, the women are dependent on others to bring food —especially vegetables, fruit, and meat— from the marketplace. As we saw in Chapter 4, most of the women in our study population (which is relatively young) do not go anywhere else than to the fields, their husband's house, and their own parent's house. In most households, men do the purchases for the household in the nearby cities. More than 80 per cent of the respondents are dependent on men, either the husband, the father-in-law, a brother-in-law or —in uxorilocal families— the father. In some households (12 per cent), the mother-in-law buys the food needed for the household. Very few women (N=5), all of higher parity, go to the marketplace themselves. On being asked whether they could ask their husband or other person going to the marketplace to bring some special food because they were pregnant, a giggle was the first answer. Several women remarked

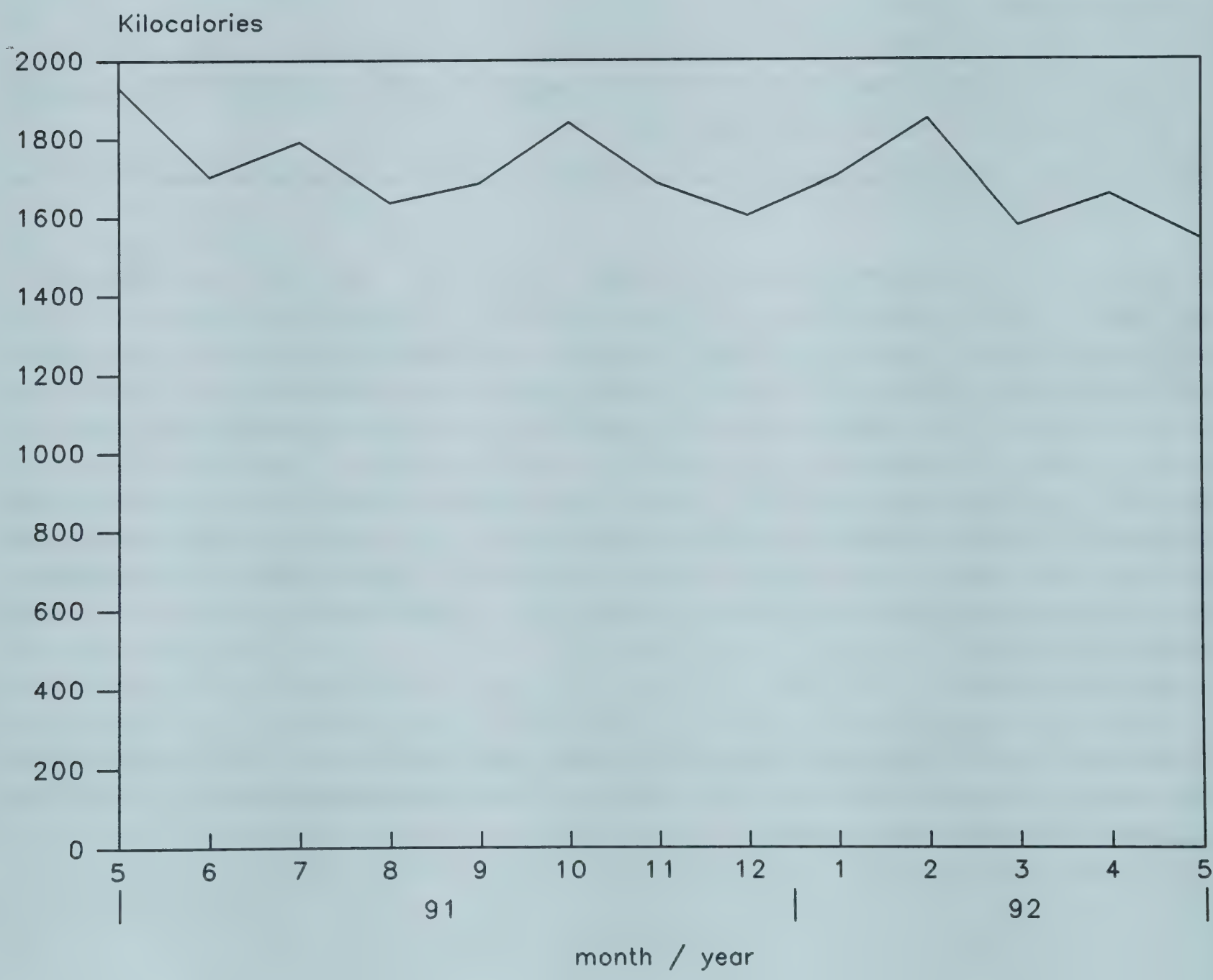
'how can I ask??',

their position in the household being one of paying respect to elders and their husband. Only few women, especially those living in a nuclear family, mentioned that they asked their husband to bring something special.

6.2.2. *Actual food intake*

Looking at the actual food intake, the average daily energy intake during pregnancy in general amounts to 1,700 kcal. (± 231). Observations of food intake were conducted throughout one year, from May 1991 to May 1992 (see also Chapter 3). Seasonal variation in daily energy intake is illustrated in Figure 6.1. These averages per calendar month are calculated based on all available observations in each month of pregnancy. This makes an interpretation of seasonal influences more difficult, because also changes due to pregnancy take place. In the figure, the averages vary from 1,577 kcal. in March 1992 to more than 1,800 kcal. in February 1992. The limited number of observations at the beginning and end of the research period, May 1991 (N=8) and May 1992 (N=9) makes interpretation difficult. The peak in the month of the October marks the period of the paddy harvest, the dip in August the period when old reserves are depleted.

Figure 6.1. Daily energy intake (kcal.) per month of the year, May 1991 to May 1992



The recommended daily energy intake for women in India, weighing 50 kg. and conducting moderate work, amounts to 2,225 kcal. per day plus 300 kcal. extra during the last two trimesters of pregnancy (ICMR, 1990). However, as we saw in the last chapter, all but a few (N=5) women in the study population have a prepregnancy weight of less than 50 kg. The average weight is 41 kg. (± 4.6). Recommendations for non-pregnant women in India weighing 35, 40, or 45 kg. respectively (in the age group of 18 to 30 years) amount to 1,824, 1,957, and 2,090 kcal. respectively (ICMR, 1990).

It is evident that women in the study population do not achieve the recommended daily energy intake, not even that of non-pregnant women. Looking at the average daily intake in the whole period of pregnancy, only 30 per cent of the women reach the level of 1,800 kcal.

For other nutrients too, the respondents' diet does not meet recommendations. The average daily intake of proteins throughout pregnancy amounts to 47.3 grammes (± 7.34) while recommended protein intake for Indian women amounts to 1 gramme per kg. body weight per day, plus 15 gr. extra during pregnancy. Given the average prepregnancy weight of 41 kg., 74 per cent of the women in the study population achieve the recommended normal level of protein intake and 11.4 per cent consume 15 gr. extra during pregnancy as recommended. Compared with other nutrients, the amount of proteins consumed is relatively high which might be related to the daily consumption of dal and gram. Average daily intake of calcium throughout pregnancy amounts to 288 mg. (± 118). The recommended intake for pregnant women amounts to 1,000 grammes per day (ICMR, 1990), a level which is reached by only a few women. Regarding the nutrient iron, average daily intake amounts to 24.7 mg. (± 7.63). Only four per cent of all women achieved the recommended intake of 38 mg. per day.

A first impression on the changes in food intake during pregnancy is provided by data in Table 6.2, which show the average daily intake of energy, protein, calcium, and iron per month of pregnancy. The averages are calculated on the basis of all available observations of food intake in each month of pregnancy. Except for the nutrient calcium, intake of protein, iron, and energy is lower at the end of pregnancy. The energy intake drops by 130 kcal. during pregnancy. In month three/four the average is 1,763 kcal., in month nine 1,621 kcal. However, not all women are represented in each group, and a comparison in average daily energy intake between the different months of pregnancy cannot easily be made. Moreover, the data are averages, and do not reveal individual differences between respondents.

We subsequently analyze energy intake longitudinally and compare intake in different months of pregnancy pairwise (see Table 6.3). The data represent the average changes in daily energy intake between different months of pregnancy for the same group of respondents. Thus, for example, daily energy intake in month nine of pregnancy is compared with daily energy intake in month three/four, taking the same group of respondents into account. The data show that among women whose food intake was measured at the beginning and the end of pregnancy (month three/four and month nine respectively) (N=20), daily energy intake declines on average by 142 kcal. Women whose food intake was measured in month three/four and month eight of pregnancy show an average decline of 124 kcal. Between month three/four and month five/six of pregnancy the average change in energy intake is positive, +16 kcal. The changes

Table 6.2. Average daily intake of energy (kcal.), proteins (g.), calcium (mg.), and iron (mg.) in different months of pregnancy

Average intake during pregnancy:	Month 3/4	5/6	7	8	9
Energy (kcal.)	1,763	1,725	1,705	1,701	1,621
Standard deviation	± 329	± 343	± 319	± 285	± 278
Protein (g.)	49.5	49.5	46.7	46.8	45.5
	± 1.29	± 1.67	± 0.95	± 0.8	± 1.2
Calcium (mg.)	296	283	302	297	278
	± 20.0	± 11.1	± 15.5	± 8.6	± 16.1
Iron (mg.)	25.9	25.9	24.6	23.4	23.1
	± 1.12	± 1.00	± 0.89	± 0.70	± 1.6
N	60	122	114	101	50

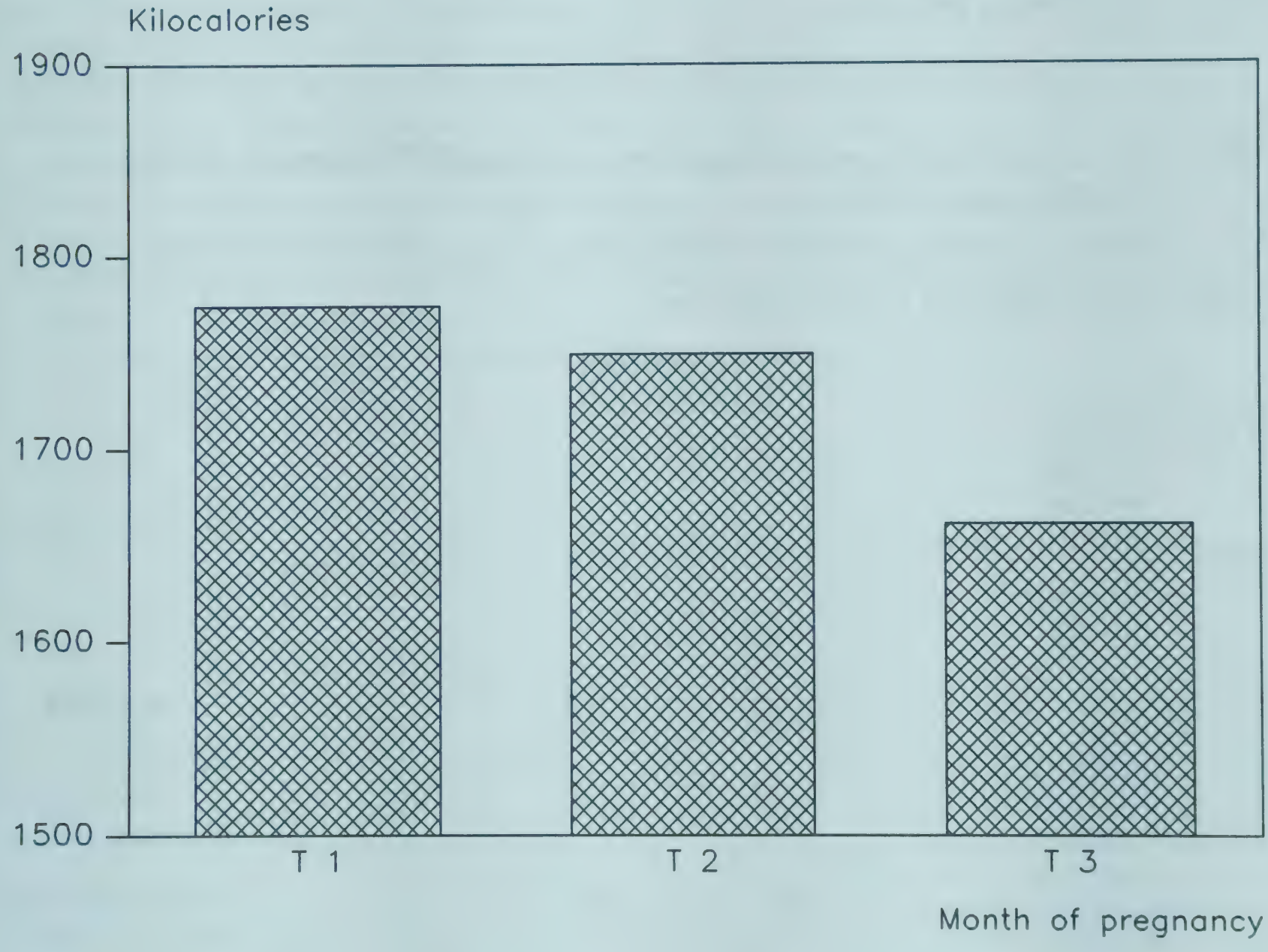
Table 6.3. Average changes in daily energy intake (kcal.) between different months of pregnancy (pairwise)

Time T2	Month 3/4	5/6	7	8	9
T1					
Month 3/4	-	+ 16 kcal N=45	- 40 kcal N=41	- 124 kcal N=37	- 142 kcal N=20
Month 5/6		-	+ 20 kcal N=65	- 26 kcal N=65	- 94 kcal N=31
Month 7			-	- 2 kcal N=65	- 87 kcal N=34
Month 8				-	- 78 kcal N=27
Month 9					-

in daily energy intake within subjects are analyzed by applying a repeated measurement analysis. Only the change between month three/four and month eight of pregnancy turns out to be significant.

In addition, to analyze changes in energy intake within subjects over the whole period of pregnancy, three points of measurements were considered: month three/four, month five/six/seven, and month eight/nine of pregnancy respectively. This latter point was chosen based on data in Table 6.3 and information gathered through the in-depth interviews as well (see Chapter 7). These data indicate that the largest change in daily energy intake during pregnancy takes place during month seven of pregnancy. In this way, we could estimate changes in energy intake over the whole period of pregnancy for 41 respondents.

Figure 6.2. Daily energy intake (kcal.) over the whole period of pregnancy (within subjects)



T1 = Month 3/4 : 1,774 kcal.
T2 = Month 5/6/7: 1,749 kcal.
T3 = Month 8/9 : 1,661 kcal.

N = 41

As can be seen in Figure 6.2, from month three/four to month five/six/seven there is a small decline in daily energy intake: from 1,774 (± 312) to 1,749 kcal. (± 279). The biggest change, however, takes place between month five/six/seven and month eight/nine of pregnancy: energy intake drops to 1,662 kcal. (± 248). This change in energy intake is not statistically significant, however.

Summarizing, these data suggest a declining daily energy intake during pregnancy, the largest change taking place at the end of pregnancy. Moreover, the high values of the standard deviations show there is a wide variation between individuals in change in energy intake. The number of respondents included in this within-subjects design, however, is limited. For a more detailed analysis we concentrate on the last interval from month five/six/seven (from now on called T1) to month eight/nine of pregnancy (from now on called T2), which enables us to include a larger number of respondents (N=113). In this group of women, changes in daily energy intake from T1 to T2 vary highly, as the frequency distribution presented in Table 6.4 illustrates. Therefore, first we study which background variables are related to change in energy intake during pregnancy.

Table 6.4. Change in daily energy intake from month 5/6/7 (T1) to month 8/9 (T2) of pregnancy (kcal.)

Change in energy intake from T1 to T2 of pregnancy	N	
< - 1,000 kcal.	2	
-1,000 - - 700 kcal.	3	
- 500 kcal.	11	
- 400 kcal.	4	
- 300 kcal.	8	
- 200 kcal.	7	
- 100 kcal.	15	
0 kcal.	12	
Total number of women reducing energy intake from T1 to T2		62 (54.9%)
0		
+ 100 kcal.	11	
+ 200 kcal.	10	
+ 300 kcal.	11	
+ 400 kcal.	7	
+ 500 kcal.	3	
+ 600 kcal.	2	
+ 700 kcal.	3	
+ 1,000 kcal.	4	
Total number of women increasing energy intake from T1 to T2		51 (45.1%)
Total		113

6.2.3. Background factors related to energy intake

In Chapter 2, on theory and facts, the Figures 2.7 and 2.9 integrate several background variables related to energy intake during pregnancy. Most of the individual background variables (like age, parity, length of last birth interval and prepregnancy weight-for-height status), and socio-economic background variables (like type of family, socio-economic status of the household, religion, and education) have been described in detail in Chapter 5. (Beliefs and subjective norms related to energy intake are described in the next chapter). In this subsection, we want to identify the variables which are related to the change in energy intake at the end of pregnancy.

First of all, we investigate the seasonal influences on change in daily energy intake from T1 to T2. As stated before, food intake was measured throughout one year: from May 1991 to May 1992. We subsequently distinguish three seasons (based on own information but also on literature like Kamath, 1983; Srinivasan, 1976; Gurumurthy, 1976). The rainy season lasting from June to September, is a period in which old reserves of the former harvest are running out. The second period covers the months following the (dry) paddy harvest: October to January. Third is the period between the harvest and the rainy season: the hot season which lasts from February to June. We subsequently examine the distribution of the number of observations per month of pregnancy in these three different periods (see Table 6.5) keeping in mind that we are primarily interested in the change in energy intake from T1 to T2. The majority of observations in month eight and nine of pregnancy were conducted in the season in which more food is available, i.e. the post-harvest and the hot season. This suggests that reduction of energy intake from T1 to T2 also takes place in periods in which more food is available.

Table 6.5. Number of observations in different months of the year and per month of pregnancy

Season	Month of pregnancy				
	3/4	5/6	7	8	9
Rainy season (June to September)	7	22	24	14	8
Post-harvest season (October to January)	36	66	63	57	25
Summer season (February to May)	17	34	27	30	17
Total	60	122	114	101	60

Subsequently, we examine the relationship of the other background variables (as mentioned above) on change in energy intake from T1 to T2. For the individual background variables (see Figure 2.9) a multiple regression analysis was applied. The following variables were included: length of last birth interval, parity, age, and prepregnancy weight-for-height status. Only prepregnancy weight-for-height status (β= -.26; $p < 0.05$) and length of last birth interval (β = .23; $p < 0.10$) turn out to be significant predictors of change in daily energy intake. However, together they explain only 10.0 per cent the variance of change. No significant effects were found for the variables age and parity. The results indicate a negative relationship between BMI before pregnancy and change in energy intake from T1 to T2. Women with a lower BMI are less inclined to reduce daily energy intake. In addition, the length of last birth interval appears to be relevant: a shorter birth interval is related to a decline in energy intake. This result might be related to the belief, described in Chapter 7, that if one feels weaker (for example, due to a short birth interval) food cannot be easily digested.

In addition, we analyze the relationship between socio-economic background variables like education, type of family, socio-economic status of the household, position in the caste system, and type of activity conducted during pregnancy.

Estimating the average change in daily energy intake from T1 to T2 for the four different socio-economic classes, we found that women situated in the lowest socio-economic class show an increase in energy intake (+ 114 kcal.) while women in the three higher socio-economic classes show a decline (see Table 6.6). However, after adjustment for prepregnancy weight-for-height status and length of last birth interval, the differences are not statistically significant. The differences in energy intake between the four socio-economic classes can therefore be partially explained by BMI and length of last birth interval. This finding seems to confirm our assumption formulated in Chapter 2 that the reasons behind the custom of reduction of food intake during the last trimester of pregnancy are not economically determined. In other words, pregnant women do not eat less during the last trimester of pregnancy because there is no food available in the household.

Regarding activities conducted during pregnancy, we distinguish two types (see Chapter 5): women keeping the house or working at home and women working outside. The two groups do not differ (see Table 6.6): both reduce energy intake slightly from T1 to T2. In addition, no differences in change in energy intake were found between nuclear and joint families or between women situated in the higher part of the caste system and scheduled caste or tribe.

Summarizing, the data suggest that a decline in energy intake at the end of pregnancy is not related to season. Regarding socio-economic status, women in the lowest socio-economic class appear to be less inclined to reduce their daily energy intake than women in the higher classes. However, these differences could be reduced to the variables BMI and length of last birth interval. Although the effects are small, the analysis indicates that women who are better nourished and women whose last birth interval is shorter are more likely to reduce energy intake between T1 and T2.

Table 6.6. Change in daily energy intake (kcal.) from month 5/6/7 (T1) to month 8/9 (T2) of pregnancy and average energy intake (kcal.) in month 8/9 of pregnancy by socio-economic status of the household and activities conducted during pregnancy

Background variables	Average change in energy intake from months 5/6/7 to month 8/9	Average energy intake in month 8/9 of pregnancy	N
Socio-economic class			
Lower	+ 114 kcal	1,713 kcal (± 280)	39
Lower-middle	- 116 kcal	1,635 kcal (± 232)	36
Middle	- 148 kcal	1,622 kcal (± 311)	22
Higher	- 162 kcal	1,734 kcal (± 236)	13
NS			3
Activity conducted during pregnancy			
Keeping the house or working at home	- 40 kcal (± 382)	1,677 kcal (± 202)	36
Working outside	- 45 kcal (± 422)	1,665 kcal (± 301)	70
NS			7
Total	- 40 kcal (± 401)	1,672 kcal (± 266)	113

Prepregnancy weight-for-height status has been identified as the best predictor of change in energy intake during pregnancy. Also, it is one of the most important variables in the analysis on effects of energy intake during pregnancy on the health condition of the mother and the pregnancy outcome (see Chapter 2). Therefore, we perform a more detailed analysis on change in energy intake from T1 and T2 (within subjects) among the different groups of CED (see Chapter 5).

First, we discern two groups of prepregnancy weight-for-height status, i.e. women who are CED (BMI $\leq$ 18.4) and women who are non-CED (BMI $\geq$ 18.5) (see Table 6.7). No main effect for prepregnancy weight-for-height was found. Change in daily energy intake within subjects turns out to be statistically significant ($p < .10$). For the whole group, average energy intake declines from 1,722 kcal. (± 315) at T1 to 1,647 kcal. (± 284) at T2. Also, the data indicate an interaction between change in energy intake and prepregnancy weight-for-height status ($p < .05$), which means that changes of energy intake differ between the two CED groups. Women in the under-nourished group hardly change daily energy intake: at T1 the average is 1,655 kcal. (± 309) and at T2 1,663 kcal. (± 258). The better nourished group of women show a decline in daily energy intake: at T1 the average is 1,811 kcal. (± 314) and at T2 1,629 kcal. (± 319). The average energy intake in the last two months of pregnancy hardly differs between the two groups. These averages indicate that better nourished women show a higher level of daily energy intake at T1, and reduce energy intake in order to reach the level of energy intake at T2 which under-nourished women already showed at T1 (see Figure 6.3).

In addition, we want to show the differences in changes in energy intake between women who are severely, moderately, and mildly CED, compared with the group of non-CED (see also Table 6.7 and Figure 6.4). The differences are substantial: women in the severe CED group appear to show an average increase in daily energy intake between T1 (1,568 kcal ± 216) and T2 (1,726 kcal ± 357) while women in the non-CED show the largest decline.

Summarizing, the data suggest that changes in energy intake differ considerably between CED groups. Energy intake is predominantly reduced by women who are well-nourished while the most vulnerable women, i.e. women in the CED group, are less inclined to reduce energy intake.

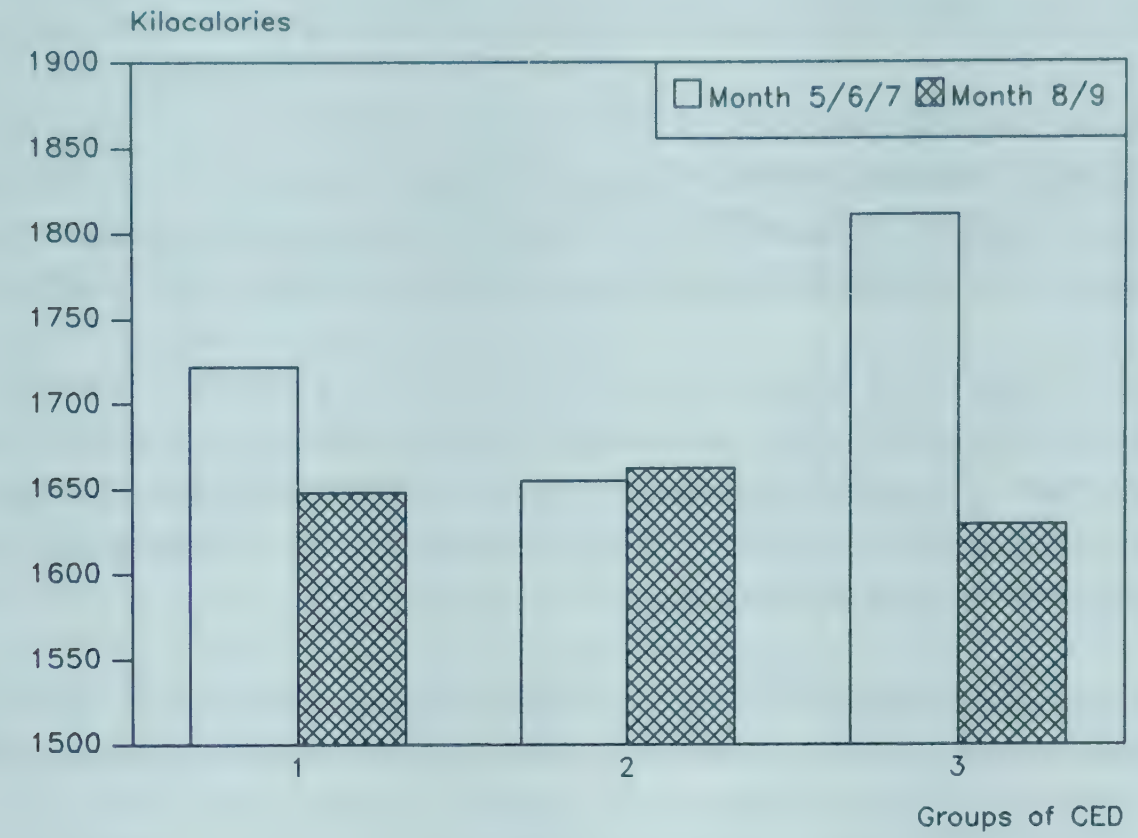
6.3. Energy intake during pregnancy and health condition of the mother

Having analyzed the change in energy intake during pregnancy and its determinants, we now focus on the effects of the change in energy intake at the end of pregnancy on the health condition of the mother, expressed as weight gain, development of skinfold thickness, and mid-upper-arm circumference over pregnancy. Other indicators of health status of women like anaemia and other illnesses have been described in Chapter 5.

Table 6.7. Change in daily energy intake (kcal.) from month 5/6/7 (T1) to month 8/9 (T2) of pregnancy (within subjects) for different groups of CED

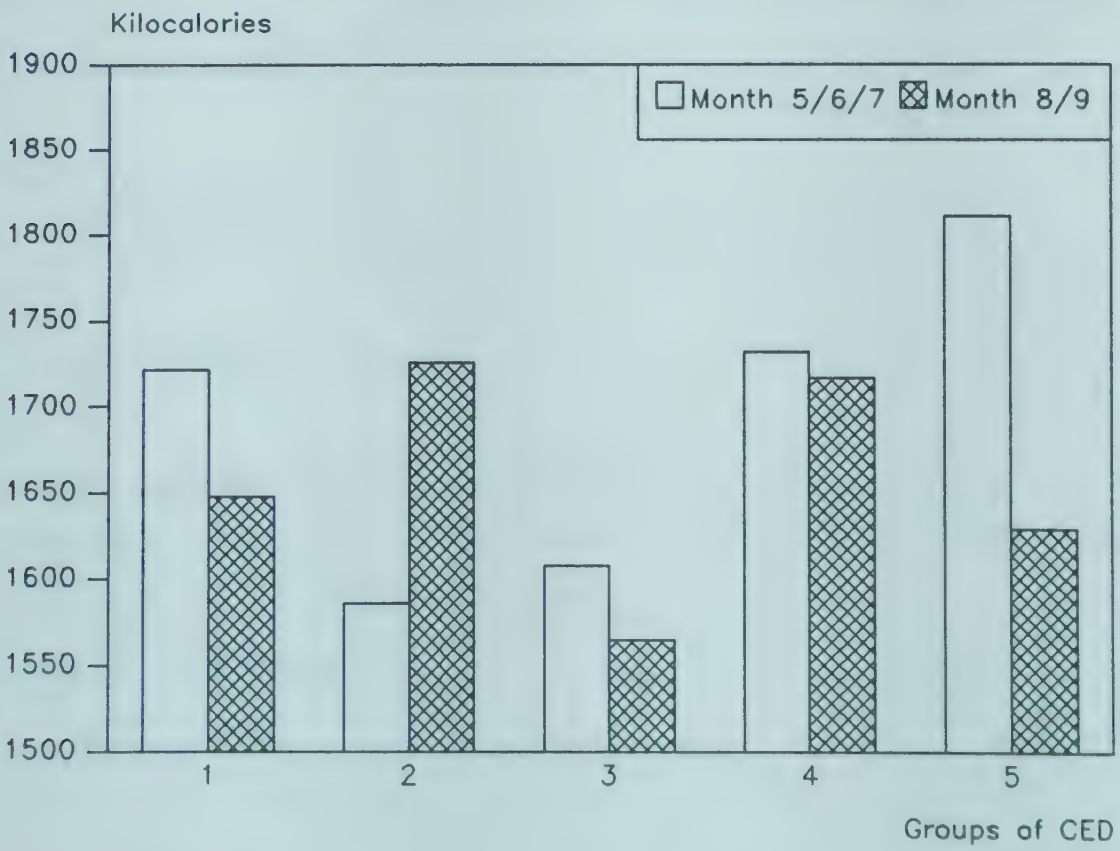
Chronic Energy Deficiency (CED) measured by Body Mass Index (BMI) (kg/cm * 100)	Average energy intake in month 5/6/7 of pregnancy	Average energy intake in month 8/9 of pregnancy	N
CED BMI ≤ 18.4	1,655 kcal (± 309)	1,663 kcal (± 258)	43
In which:			
Severe CED BMI ≤ 16.0	1,586 kcal (± 216)	1,726 kcal (± 357)	9
Moderate CED ≥16.1 BMI ≤ 16.9	1,608 kcal (± 333)	1,565 kcal (± 197)	16
Mild CED ≥17.0 BMI ≤18.4	1,732 kcal (± 324)	1,717 kcal (± 236)	18
No CED BMI ≥ 18.5	1,811 kcal (± 315)	1,629 kcal (± 319)	33
Whole group	1,722 kcal (± 315)	1,647 kcal (± 284)	76

Figure 6.3. Change in daily energy intake (kcal.) from month 5/6/7 (T1) to month 8/9 (T2) of pregnancy (within subjects) for two groups of CED



1 = Whole group: 1722 - 1647 kcal. 2 = CED: 1655 - 1663 kcal. 3 = Non-CED: 1811 - 1629 kcal.

Figure 6.4. Change in daily energy intake (kcal.) from month 5/6/7 (T1) to month 8/9 (T2) of pregnancy (within subjects) for four groups of CED



1 = Whole group: 1722 - 1647 kcal.
2 = Severe CED: 1586 - 1726 kcal.
3 = Moderate CED: 1608 - 1565 kcal.
4 = Mild CED: 1732 - 1717 kcal.
5 = Non-CED: 1811 - 1629 kcal.

6.3.1. Maternal weight gain

Weight gain during pregnancy could be estimated for 84 women of the total group of 118 women (see Section 6.1 and Figure 6.1). Among these women, the average weight gain was 6.4 kg. (± 3.2).

Keeping in mind the research question, i.e. what are the effects of a reduction in energy intake at the end of pregnancy among women whose nutritional status before conception is already poor, the following variables were included in a multiple regression analysis: change in energy intake, prepregnancy weight-for-height status, and length of last birth interval.

Only prepregnancy weight-for-height status turns out to be a significant predictor of weight gain ($\beta = -.32$; $p < 0.05$). However, it explains only 12.5 per cent of the variance of weight gain during pregnancy. No significant effects were found for the other variables. The results indicate that women with a lower BMI before pregnancy are likely to gain more weight during pregnancy than women with a higher BMI.

Let us take a closer look at the differences in weight gain between the different CED groups, thereby classifying women in two and four groups of CED respectively (see Table 6.8).

Table 6.8. Average weight gain (kg.) during pregnancy for different groups of prepregnancy weight-for-height status

Chronic Energy Deficiency (CED) measured by Body Mass Index (BMI) (kg/cm * 100)	Average weight gain during pregnancy	N
CED BMI ≤ 18.4	7.2 kg (± 2.9)	52
In which: Severe CED BMI ≤ 16.0	8.2 kg (± 2.7)	11
Moderate CED > 16 BMI ≤ 16.9	6.8 kg (± 2.4)	17
Mild CED ≥ 17 BMI ≤ 18.4	6.9 kg (± 3.2)	24
No CED ≥ 18.5	5.2 kg (± 3.3)	32
NS		34
Whole group	6.4 (± 3.2)	84

Women in the under-nourished group (BMI $\leq$ 18.4) gain on average 7.2 kg. ($\pm$ 2.9) while women in the non-CED group (BMI $\geq$ 18.5) gain on average 5.2 kg. ($\pm$ 3.3). Differentiating for four CED groups, we find that women in the severe CED group gain on average 8.2 kg. ($\pm$ 2.7) during pregnancy and women in the moderate and mild CED group 6.8 ($\pm$ 2.4) and 6.9 kg. ($\pm$ 3.2) respectively.

Another relevant factor for weight gain during pregnancy (see also Chapter 2) is physical activity conducted during pregnancy (see Table 6.9). We see that women keeping the house or working at home during pregnancy gain a little more weight during pregnancy (7.0 kg. $\pm$ 2.8) than women who work outside (6.1 kg. $\pm$ 3.4).

In the regression analysis, especially the lack of a relationship between change in energy intake from T1 to T2 and maternal weight gain during pregnancy needs some further attention. First, we examine the relationship between change in energy intake and weight gain for two different groups of CED (Table 6.10). The data indicate a main effect for prepregnancy weight-for-height status ($p < .05$) only. This means that, independent of change in energy intake, prepregnancy weight-for-height status affects the total weight gain during pregnancy. The averages in the table suggest that women who reduce energy intake from T1 to T2 and who are situated in the CED group gain on average more weight during pregnancy (7.9 kg.) than women who are situated in the non-CED group (4.6 kg.). Women increasing energy intake and situated in the CED group gain on average 6.1 kg.

Table 6.9. Average weight gain (kg.) during pregnancy per category of activities conducted during pregnancy

Activities conducted during pregnancy	Average weight gain over pregnancy (kg)	N
Keeping the house or working at home	7.0 kg ($\pm$ 2.8)	27
Working outside	6.1 kg ($\pm$ 3.4)	51
NS		6
Total population	6.4 kg ($\pm$ 3.2)	84

Table 6.10. Average weight gain (kg) during pregnancy for two groups of Chronic Energy Deficiency (CED) and change in daily energy intake from month 5/6/7 (T1) to month 8/9 (T2) of pregnancy

Change in daily energy intake T1 - T2	CED			
	BMI $\leq$ 18.4	N	BMI $\geq$ 18.5	N
$\leq$ 0 kcal	7.9 kg	18	4.6 kg	17
> 0 kcal	6.1 kg	18	4.9 kg	8

In addition, we conduct the same analysis, taking into account the average energy intake in the last two months (Table 6.11), a main effect for prepregnancy weight-for-height status ($p < 0.05$) **and** for average energy intake in the two last months of pregnancy ($p < 0.05$). The data suggest that women who eat less than 1,600 kcal. in the last two months of pregnancy are more inclined to gain weight during pregnancy than women who consumed more than 1,750 kcal. However, as in the former analysis, given the limited number of observations these data must be interpreted with care.

There seems to be no relationship between change in energy intake from T1 to T2 and total weight gain during pregnancy. We wonder whether there is a relationship between change in energy intake from T1 to T2 and weight gain in the same period. Multiple regression on the effects of change of energy intake, prepregnancy weight-for-height status, and length of last birth interval on weight between T1 and T2 showed no significant effects for either of these variables. This finding suggests that there is no relationship between change in energy intake and weight gain.

However, if we classify women in three categories, i.e. women who either reduce or increase energy intake to a larger extent (by more than 300 kcal.) and women showing a change in energy intake between these two extremes, we find a significant difference in weight gain between T1 and T2 ($p < .05$). Women reducing energy intake by more than 300 kcal. show the lowest weight gain (0.97 kg.) which suggests that a larger reduction of energy intake leads to lower weight gain between T1 and T2. However, remarkably the in-between group gain most weight (2.27 kg.) while women who increased energy intake by more than 300 kcal. showed an average weight gain of 1.73 kg. Part of the difference between the three groups can be explained by the fact that women keeping the house or working at home during pregnancy gain significantly more weight ($p < .05$) between T1 and T2 (2.71 kg.) than women who work outside (1.54 kg.).

Table 6.11. Average weight gain (kg.) during pregnancy for two groups of Chronic Energy Deficiency (CED) and average daily energy intake in the last two months of pregnancy

Average daily energy intake in last two months of pregnancy	CED			
	BMI ≤ 18.4	N	BMI ≥ 18.5	N
< 1600 kcal	7.9 kg	18	6.0 kg	11
1600 - 1750 kcal	7.2 kg	8	5.1 kg	4
> 1750 kcal	6.1 kg	12	3.2 kg	10

In conclusion, the data suggest that prepregnancy weight-for-height status affects total weight gain during pregnancy: women in the non-CED group gain less weight during pregnancy. Furthermore, the data suggest no relationship between change in energy intake from T1 to T2 and total maternal weight gain during pregnancy. In addition, no relationship was found between change in energy intake and weight gain between T1 and T2, although women who reduced energy intake to a larger extent (- 300 kcal.) show the lowest weight gain during this two-months period. The type of activity conducted during pregnancy appears to be relevant: women working outside gain significantly less weight in this particular period.

6.3.2. Development of skinfolds thickness and mid-upper-arm circumference

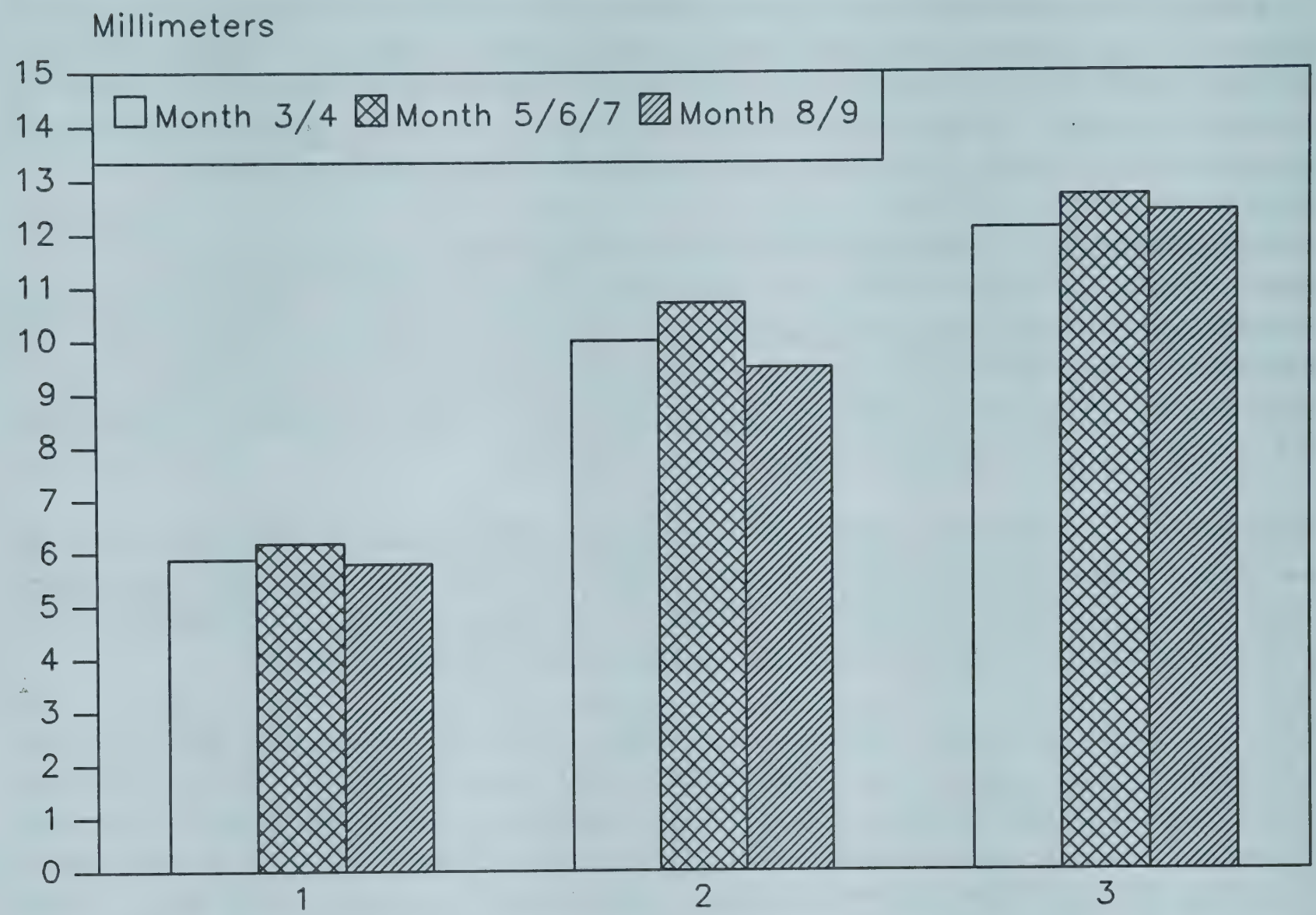
Other indicators of health condition of women during pregnancy are development of thickness of different skinfolds and mid-upper-arm circumference. In Chapter 3 we explained that initially we intended to measure changes in skinfolds of biceps, triceps, subscapular, supra-iliac, and tight. However, estimation of the last two skinfolds was not possible as respondents did not agree to measurements on these parts of the body.

Data on skinfold thickness were gathered by the nutritionists at the same points of measurement as food intake: month three/four, five/six, seven, eight, and nine of pregnancy. Therefore, regarding the development of skinfolds throughout pregnancy, we follow the same procedure as we did in Subsection 6.1.2 on changes in daily energy intake.

First, we analyze the change in skinfolds of biceps, triceps, and subscapular within subjects by taking three measurements: month three/four, month five/six/seven, and month eight/nine. In this way, we could conduct a repeated measurement analysis for 38 women. The results are presented in Figure 6.5. The data show that skinfold of biceps increases between month three/four and month five/six/seven, and then decline in order to reach a level slightly below the one in the first months of pregnancy. Changes in skinfold of subscapular are positive between month three/four and five/six (from 12.1 to 12.7 mm.) and decline in the last period (to 12.4 mm.). Only the changes in skinfold of triceps turned out to be significant: from month three/four to month five/six/seven and to month eight/nine as well ($p < 0.05$). In addition, for the following analysis we wanted to sum the three different skinfolds. Before we started to analyze, however, we first conducted a reliability analysis to check whether the three measures can be considered as one reliable scale and can be summed. Cronbach alfas were computed for the three skinfolds of biceps, triceps, and subscapular in each period of pregnancy. This resulted in $\alpha = .81$, $\alpha = .77$, and $\alpha = .87$ respectively, indicating that the three skinfolds form a reliable scale. Subsequently we analyzed the effects of a change in energy intake from T1 to T2 on development of the summed skinfolds.

Multiple regression analysis was performed to analyze the effects of change in energy intake, prepregnancy weight-for-height status, and length of last birth interval on change in summed skinfolds. Prepregnancy weight-for-height status ($\beta = .19$; $p < .05$) and change in energy intake ($\beta = -32$; $p < .05$) both appear to be significant predictors of the change in skinfolds.

Figure 6.5. Development of skinfold thickness (mm) of biceps, triceps and subscapular throughout pregnancy



1 = Biceps
2 = Triceps
3 = Subscapular
N = 38

The relationship between prepregnancy weight-for-height status with change in skinfolds appears to be positive, indicating that women with a higher BMI are more likely to show an increase in summed skinfolds than women with a lower BMI. This is a remarkable finding, as in the former part of this section we found an opposite relationship: lower BMI generally coincides with higher weight gain.

The relationship between change in energy intake and change in skinfolds appears to be negative, which indicates that women who reduce energy intake are more likely to show an increase in skinfolds than women who increased energy intake. This, too, is remarkable, as we would expect the opposite. If we plot the values of the two variables, a group of about ten women appear to show a high value on change in energy intake and a low value on development of skinfolds, which explains the negative relationship. After removal of these ten women, observations of other respondents turned out to be not correlated (r= -0.04).

No differences were found in the change in summed skinfolds between women who work only at home and women who work outside.

Measurements of thickness of skinfolds are supposed to be indicators of changes in fat content of the body. However, not only gain in fat is measured but in the case of an increase of fluids in the body, for example due to oedema, skinfolds also become larger.

Mid-upper-arm circumference was measured throughout pregnancy. Group averages in different months of pregnancy do not differ, all values fluctuating around 22.8 cm. The longitudinal data however suggest an average change in mid-upper-arm circumference over pregnancy of -0.7 cm. No significant changes were found between women who reduce and women who increase energy intake, or between women in different CED groups.

Summarizing, prepregnancy weight-for-height status appears to be an important factor related to total weight gain during the whole pregnancy. The data suggest that women with a lower BMI before pregnancy gain more weight than women with a higher BMI. In addition, no linear relationship was found between change in energy intake from T1 to T2 and weight gain in the same period. However, women who reduce energy intake to a larger extent turn out to gain less in weight (0.97 kg.) than the others.

6.4. Energy intake and pregnancy outcome

Having analyzed the relationship between energy intake and health condition of the women during pregnancy, in this section we focus on the pregnancy outcome.

6.4.1. Birth weight, length, and head circumference of children

Average birth weight of all the children born alive in the project was 2,646 grammes (± 464). 26.1 per cent of the children are of Low Birth Weight (LBW: < 2,500 grammes). The average length of the children at the time of delivery was 47.2 centimetres (± 3.3) while the average head circumference was 33.6 cm (± 2.6).

Before we examine the effects of energy intake on birth weight, first we look at some other variables related to birth weight (see Table 6.12). Of all children, 17.9 per cent were born prematurely, i.e. before 37 weeks of gestation. This group shows a significantly ($p < 0.10$) lower average birth weight of 2,411 (± 419) grammes than those born after 37 weeks who weighed 2,700 grammes (± 650). The correlation coefficient between length of gestation and birth weight is estimated at .27.

Among baby girls the average birth weight is lower (2,614 grammes ± 447) than for boys (2,682 grammes ± 488). In the first group, the percentage of LBW children is 29.5 per cent while in the second group it is 23.3 per cent.

In addition, the birth weight of primiparae differs significantly ($p < 0.05$) from the weight of children born to women of higher parity. In the first group, the average birth weight is 2,437 grammes (± 595), in the second 2,696 grammes (± 416).

Table 6.12. Average birth weight (gr.) by length of period of gestation, parity, anaemia, and sex of the child

Variables	Average birth weight (gr.)	N
Length of gestation		
< 37 weeks (premature)	2,411 ± 419	9
≥ 37 weeks (term)	2,700 ± 650	69
NS		10
Parity		
Primiparae	2,437 ± 595	17
Multiparae	2,696 ± 416	71
Anaemia / Hb level gr/dl		
< 11 gr/dl	2,593 ± 430	33
≥ 11 gr/dl	2,748 ± 439	41
NS		14
Sex of the child		
Female	2,614 ± 447	43
Male	2,682 ± 488	45
Whole group	2,646 ± 464	88

Women with anaemia (here defined as a Hb-level below 11 gr/dl; only a few women had a level below 10 gr/dl) show a lower average birth weight (2,593 grammes ± 430) than those with higher Hb-level (2,748 grammes ± 439). However, the differences are not significant. The percentage of LBW children in the first group is 27.3 per cent, in the second group 22.0 per cent.

6.4.2. Energy intake during pregnancy and birth weight of children

To analyze the effects of energy intake during pregnancy on birth weight, we conducted a multiple regression analysis including the variables length of last birth interval, prepregnancy weight-for-height status, change in energy intake from T1 to T2, and total weight gain during pregnancy. Only weight gain during pregnancy appears to be a predictor of the birth weight of children ($\delta = .36$; $p < .05$). This indicates that women who gain more weight during pregnancy are more likely to give birth to children with a higher birth weight than women who gain less weight during pregnancy. No significant relationship with birth weight was found for the other variables. Neither change in energy intake nor prepregnancy weight-for-height status appears to be related to birth weight.

To see how birth weight varies between the different CED groups and between levels of energy intake, we subsequently give the averages for two and four classes of CED (see Table 6.13) and different levels of energy intake (see Table 6.14).

Table 6.13. Average birth weight (gr.) for different classes of Chronic Energy Deficiency (CED), measured by Body Mass Index (BMI)

Chronic Energy Deficiency (CED) measured by Body Mass Index (BMI) (kg/cm * 100)	Average birth weight	N
CED BMI ≤ 18.4	2,619 gr (± 481)	49
In which:		
Severe CED BMI ≤ 16.0	2,615 gr (± 333)	11
Moderate CED > 16 BMI ≤ 16.9	2,456 gr (± 323)	13
Mild CED ≥ 17 BMI ≤ 18.4	2,706 gr (± 586)	25
No CED ≥ 18.5	2,647 gr (± 445)	36
NS		3
Whole group	2,646 gr (± 464)	88

Table 6.14. Average birth weight (gr.) according to change in energy intake from month 5/6/7 to month 8/9 and average daily energy intake in month 8/9 of pregnancy

	Average birth weight	N
Change in daily energy intake from month 5/6/7 to month 8/9		
≤ 0 kcal	2,657 gr (± 504)	37
> 0 kcal	2,671 gr (± 423)	25
Average daily energy intake in month 8/9 of pregnancy		
< 1,600 kcal	2,653 gr (± 506)	30
1,600 - 1,750 kcal	2,578 gr (± 494)	17
> 1,750 kcal	2,693 gr (± 406)	20
Whole group	2,646 gr (± 464)	88

The first data show that the average birth weight of children born to women in the severely CED group (2,615 grammes ± 333) does not differ from the average birth weight of children born to women in the well-nourished group (2,647 grammes ± 445). Only children born to women in the moderate CED group show a lower (but not significant) average birth weight of 2,456 grammes (± 323). Neither were differences found for two groups of CED (BMI ≤ 18,4 and BMI ≥ 18.5). The average birth weight among women in the first group amounts to 2,619 grammes (± 481), in the second group to 2,647 grammes (± 445).

In Table 6.14, two broad categories of women are distinguished, i.e. women who reduce and women who increase energy intake from T1 to T2. Comparing the average birth weight between these two groups no differences can be observed. Women who reduce energy intake give birth to children with an average birth weight of 2,657 grammes (± 504), women who increased energy intake to children with an average weight of 2,671 grammes (± 423). This finding suggests that a reduction of energy intake from T1 to T2 does not affect the birth weight of children. In addition, we relate the average energy intake in the last two months of pregnancy to birth weight. From the table, it becomes evident that women who consume less than 1,600 kcal. in the last two months of pregnancy gave birth to children weighing as much (2,653 grammes ± 506) as children born to women who consumed more than 1,750 kcal. (2,693 grammes ± 406).

To find out the effects of energy intake on birth weight for the different CED groups Table 6.15 was constructed. The data suggest that well-nourished women (BMI ≥ 18.5) who reduce energy intake from T1 to T2 have the lightest babies (2,543 grammes) while the women in

Table 6.15. Average birth weight (gr) of children for two groups of Chronic Energy Deficiency (CED) and daily energy intake during the last trimester of pregnancy

Change in daily energy intake from month 5/6/7 to month 8/9	CED			
	BMI ≤ 18.4	N	BMI ≥ 18.5	N
≤ 0 kcal	2,730 gr (± 541)	16	2,543 gr (± 464)	19
> 0 kcal	2,613 gr (± 452)	17	2,794 gr (± 348)	8
Average daily energy intake month 8/9				
< 1600 kcal	2,655 gr (± 584)	16	2,602 gr (± 393)	13
1600 - 1750 kcal	2,713 gr (± 368)	10	2,382 gr (± 609)	7
> 1750 kcal	2,628 gr (± 450)	10	2,731 gr (± 382)	9

the lower CED group (BMI ≤ 18.4) who reduced energy intake have heavier children (2,730 grammes). This is remarkable and suggests that change in energy intake from T1 to T2 predominantly affects birth weight of children among women who are well-nourished. However, the importance of this finding is unclear as the difference is not statistically significant and the number of observations is limited.

We compare this table with Table 6.7, in which the relationship of BMI, change in energy intake, and weight gain during pregnancy are given. The data suggest that under-nourished women who reduce their energy intake from T1 to T2 gain more weight over pregnancy (7.9 kg.) and give birth to children weighing an average 2,730 grammes. Women who are well-nourished and reduce energy intake gain less weight over pregnancy (4.6 kg.) and have children who have an average birth weight which is lower, i.e. 2,543 grammes.

Summarizing, in this study no relationship has been found between either prepregnancy weight-for-height status or change in energy intake and birth weight of the child. The data suggest that children born to women who are under-nourished before pregnancy show an average birth weight which is not significantly different from the birth weight of children born to women who were well-nourished before pregnancy starts.

6.4.3. Development of children in the first month of life

As stated in Chapter 2, several studies show that children in developing countries are able to gain more weight than children in industrialized countries, especially in the first month of life. Therefore, in this research project not only birth weight but also growth and development of children in the first month of life was studied.

Before we start the analysis, we should remember that perinatal mortality in the study population appeared to be high, i.e. 85 per 1,000 live births (see Chapter 5). A certain proportion of LBW children thus might already have been sieved out.

The weight gain of children during the first month of life could be estimated for 90 children. The average birth weight for these children was 2,626 grammes, the average length was 47.0 cm. After one month of life, the average weight was 3,438 grammes (± 634), while the average length was 50.3 centimetres.

Growth velocity (grammes weight gain per kg. body weight per day) in the first month of life among these children amounts to 10.3. In Table 6.16 this figure is compared with results of studies conducted in other countries (based on Boersma *et al.*, 1988). Children in this study experience a growth velocity in the first month of life similar to children in Tanzania and Nigeria. The values are higher than in the industrialized countries.

In addition, within the sample some differences could be observed. Growth velocity of premature children was higher (11.5) than among mature children (10.1), although the difference in velocity was not significant.

Table 6.16. Growth velocity (grammes weight gain per kg. body weight per day) in the first month of life

Country	Month 0-1
United Kingdom*	6.1
USA*	7.8
Singapore*	9.1
Tanzania*	10.5
Nigeria*	10.1
This study	10.3

* Source: Boersma *et al.*, 1988, p. 217).

6.5. Summary

The diet of the women in the study population appears to be deficient in several kind of nutrients. Most respondents do not even achieve the recommended levels of energy, protein, iron, and calcium intake for non-pregnant women. Besides the poor economic circumstances, another constraint regarding food intake of women is the distribution of food within the family. Only after men and children have finished their meals, are women allowed to eat what is left over. In addition, most women (especially the younger ones) are dependent on others to bring food from the market place.

In general, the average daily energy intake during pregnancy amounts to 1,700 kcal. Based on a small group of respondents (N=41) we found a trend of declining energy intake within subjects over the whole period of pregnancy. The biggest change takes place between month five/six/seven and month eight/nine of pregnancy.

Several background variables are found to be related to change in energy intake. The major determinants of change in energy intake turn out to be prepregnancy weight-for-height status (β = -.26) and length of last birth interval (β = .23).

With regard to the first variable, women who are better nourished are more likely to reduce energy intake than women who are under-nourished before pregnancy. Results of a repeated measurement analysis show that women in the under-nourished group hardly change energy intake while the better nourished women show a decline in energy intake. The average energy intake in the last two months of pregnancy hardly differs between the two groups. This indicates that better nourished women show a higher level of energy intake at T1, reduce energy intake in order to reach the level of energy intake at T2 which under-nourished women already had at T1.

The average weight gain of women during the whole period of pregnancy is 6.4 kg. Again, prepregnancy weight-for-height status turns out to be the major determinant of weight gain (β = -.32). Women with a lower BMI before pregnancy are likely to gain more weight during pregnancy than women with a higher BMI. The same was found by Kusin *et al.* (1992 and 1993) in Indonesia and Winkvist *et al.* (1990) in Pakistan.

Regarding the different types of activities conducted, women keeping the house or working at home during pregnancy gain a little more during pregnancy (7.0 kg. $\pm$ 2.8) than women who work outside (6.1 kg. $\pm$ 3.4). No relationship was found between change in energy intake and total weight gain during pregnancy. Looking at the differences in weight gain during pregnancy for two groups of CED and changes in energy intake, under-nourished women who reduce energy intake appear to gain most weight. Apparently, it is not the change in energy intake, but the health status before pregnancy which influences the weight gain.

Analysis of the relationship between change in energy intake from T1 to T2 and weight gain in the same period showed no linear relationship. However, women who reduced energy intake by more than 300 kcal. show a significantly lower weight gain.

The average birth weight for all live births amounts to 2,646 grammes. 26.1 per cent of the children were of Low Birth Weight. Premature children and primiparae show a significantly lower birth weight. Total weight gain during pregnancy turns out to be the best predictor of birth weight (β = .36). No relationship was found between prepregnancy weight-for-height status and birth weight. The average birth weight of children born to women in the CED group hardly differs from that of children in the non-CED group. This finding is not in accordance with other studies, which report a positive relationship between prepregnancy weight-for-height status and birth weight. In addition, the data suggest that a reduction of energy intake at the end of pregnancy does not affect the birth weight of children.

Summarizing, the data suggest that under-nourished women who reduce their energy intake from T1 to T2 gain more weight during pregnancy (7.9 kg.) and have children weighing on average 2,730 grammes. Women who are well-nourished and reduce energy intake gain less weight during pregnancy (4.6 kg.) and have lighter babies, i.e. 2,543 gr. However, the number of observations is limited.

In addition, we found a growth velocity (grammes weight gain per kg. body weight per day) of children in the first month of life of 10.3. This figure is higher than that reported for children in industrialized countries and resembles that found for children in Tanzania and Nigeria.

In this chapter we found that a reduction of food intake during the last trimester of pregnancy is not related to economic or ecological factors. Energy intake is reduced throughout the year. Women situated in the lower socio-economic class even appear to increase energy intake from T1 to T2 while women in the higher classes reduced intake. The facts that women with a higher BMI and women with shorter last birth intervals are more likely to show a reduction in energy intake, suggest that physiological reasons play a role. We shall return to this in the next chapter.

Chapter 7 Beliefs about nutritional and other behaviour during pregnancy

In the former chapter, we found a trend of decreasing energy intake at the end of pregnancy. However, not all respondents appeared to reduce their energy intake. The data indicated that women who were well-nourished before pregnancy and women who showed a shorter last birth interval are more likely to eat less. In this chapter, we focus on the perceptions of the women themselves about their food intake during pregnancy.

In Chapter 2, we constructed a model on maternal nutritional behaviour, based on the value-expectancy model of Fishbein and Ajzen (1975) (see Figure 2.9). Some of the variables present in the model, like actual eating behaviour and some of the constraints on this behaviour already have been discussed. Now, we focus on the beliefs of respondents about the consequences of nutritional behaviour during pregnancy and the evaluation of these consequences, which together form the attitude towards this behaviour. The beliefs of important others and the motivation of respondents to conform to them (constituting the subjective norm) are considered too.

Perceptions about nutritional behaviour during pregnancy are not only related to the quantity of food intake, but also to the quality. In Section 7.1 we describe perceptions regarding the quality of food intake, in Section 7.2 those regarding quantity of food intake. Moreover, we discuss related beliefs about other proper behaviour during pregnancy (Section 7.3).

In addition, we discuss the related background variables. In Chapter 2, we postulated that the perceived consequences of eating behaviour during pregnancy are embedded in different bodies of knowledge of which the medical system Ayurveda is most important here. The basic concepts of this medical system have been described in Chapter 4. Nestled within Hindu religion and mingled with concepts of traditional medicine, Ayurveda generates classifications of food and notions of ethnophysiology which are reflected in beliefs and behaviour of individuals. In addition to this background variable, other personal, social, and cultural background factors like age, parity, education, kind of family, and religion are considered.

The information presented in this chapter is based on the interviews conducted with 158 women, and the in-depth interviews conducted with 32 of them.

7.1. Beliefs about the quality of food intake during pregnancy

Beliefs concerning the quality of food intake can be divided into two categories: those regarding food to be avoided and those regarding food to be added or eaten extra during pregnancy.

7.1.1. Food to be avoided

The following items are mentioned by the respondents as food to be avoided during pregnancy (see Table 7.1): papaya (mentioned by 72.2 per cent of the respondents), fresh coconut (*hasi cobri*: 65.2 per cent), banana (45.6 per cent), (white) sesamum (36.7 per cent), sweet potato (31.6 per cent), peanut (17.7 per cent), pumpkin (15.8 per cent), and jackfruit (10.2 per cent). Other food items —reported by less than 10 per cent of the respondents— are *ginna* (colostrum of the cow or buffalo from which a special sweet is made), fresh green chillis, watermelon, *kekkerhannu* (musk-melon), and non-vegetarian food (meat, fish, and eggs).

Although the kind of food items to be avoided are generally agreed on, the perceived consequences of consumption are more diverse. Some food items are believed to have one effect only. For example, all respondents relate banana and fresh coconut to illnesses of the child after delivery. Perceived consequences of other food items, however, vary. For example, 33,6 per cent of the respondents classify papaya as heating and to be avoided because it would induce a spontaneous abortion. Others (32,7 per cent) however categorize the fruit together with food items like banana and fresh coconut, as having an adverse effect on the health of the child. And another small group classifies papaya together with other heating food like sweet potato, peanut, jackfruit, pumpkin, *ginna*, fresh chillis, and *kekkerhannu* and believe it would cause either rashes and birthmarks on the skin of the child or swelling in the body of the mother. All these different perceived consequences, as mentioned in this example of papaya, are worked out in this section.

*Table 7.1. Food items to be avoided during pregnancy**

Food items to be avoided during pregnancy	Mentioned by number and % of women	
Papaya	114	72.2%
Fresh coconut (*hasi cobri*)	103	65.2%
Banana	72	45.6%
(White) sesamum	58	36.7%
Sweet potato	50	31.6%
Peanut	28	17.7%
Pumpkin	25	15.8%
Jackfruit	16	10.2%
Sweet made of colostrum of cow or buffalo (*ginna*)	8	5.0%
Fresh green chillis	6	3.8%
Watermelon	5	3.2%
Musk melon (*kekkerhannu*)	6	3.8%
Meat, fish, or eggs	2	1.3%

* Total number of women = 158.

Heating. Most respondents claim to avoid papaya during pregnancy. Some specify it further and avoid it especially during the first months of pregnancy. The main reason not to eat papaya is that its heating qualities (*ushna* in Hindi, *kaavu* in Kannada) might induce a spontaneous abortion. The concept of heating is related to the medical system Ayurveda where food and other items are classified according to their effects on the human body. The dichotomy heating and cooling is only one of the attributes of food (see Chapter 4). In general, pregnancy is believed to be a process of increasing heat (*jvara*). The child is growing, activity takes place, implying that heat is created. This heat is considered normal during pregnancy, not only by laypersons but also by medical professionals as the following case study of B. illustrates[4].

CASE STUDY

T: "she is saying, her problem is: her body is burning
I: what is burning?
C: like *khara* (chilli) it is burning
T: burning means: like chillipowder attached to the body, like that, it is burning like that
I: where is it burning, in her stomach?
C: stomach, inside the stomach and legs; from stomach to bottom: a burning sensation. Like chillipowder
I: did she go to a doctor?
T: she went to the doctor, but the doctor said: so, now you are completing nine months of pregnancy, it is like that, it is normal"

Increasing heat is considered normal during pregnancy, however too much heat is considered to have adverse effects. Depending on the amount and the kind of heat created, the following effects are known. First of all, spontaneous abortions can occur. In addition, too much heat might also result in health problems for the mother: besides a burning sensation in the body, as mentioned above, other symptoms include a burning sensation with urination, burning eyes, cracks in the feet, and swelling of hands and legs. Furthermore, too much heat might have minor effects on the health of the child after delivery: rashes, pimples, birthmarks, and other skin diseases can result. These different perceived consequences of too much heat during pregnancy are discussed next.

Heating and leading to a spontaneous abortion. Termination of pregnancy is believed to occur if too much heat is created. As the mother of one of the respondents says:

" .. if there is (too much) **kaavu**, there will be no development of the child".

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[4] In all case studies presented the following abbreviations are used:
T = translator / interpreter
I = interviewer
C (or any other letter in the following case studies) = the respondent.

Too much heat can be created by either food, season (summertime), body constitution or other circumstances. One of the food items creating heat, i.e. papaya, has already been mentioned. Traditional birth attendants are reported to use this fruit also in order to induce an abortion.

A few respondents believe other food classified as heating (like sweet potato, sesamum, and pumpkin) to cause a spontaneous abortion too.

Too much heat can also be created by having sexual intercourse during pregnancy. And, as a research assistant explained, even more heat is created during sexual intercourse if men have bad habits like smoking and drinking alcohol (which is considered to be extremely heating). In general, it is believed that sexual intercourse should stop after four or five months of pregnancy. In the following case study, this effect of sexual intercourse is illustrated while another item creating too much heat, i.e. allopathic medicines is also mentioned.

CASE STUDY

K., who participated in our research project, had a spontaneous abortion after a gestation period of six months. When the local nurse came to see her and asked what had happened, she confided that she and her husband had had sexual intercourse the night before. It must have created too much heat, the spontaneous abortion being the consequence.

When we visit K. a day later, she does not want to convey this private information to us and she tells us another story. She had taken some tablets for a headache the day before her spontaneous abortion took place. These tablets created too much heat, inducing the miscarriage.

Besides tablets also injections, for example the tetanus injections provided during pregnancy, are believed to create too much heat. When we conducted the feasibility study in 1989, this effect was mentioned by respondents as the reason they refused these injections. Furthermore, hard work or carrying heavy things can create too much heat:

CASE STUDY

N. was pregnant and lost her child in the seventh month of pregnancy: it was a stillbirth. When asked about factors responsible for this stillbirth, she shrugged her shoulders and said:

"only God knows, it is He who decides".

Her husband, however, explained later that she performed too much heavy work: just three or four days earlier to the stillbirth she carried 35 kg. of cotton from the fields to her home. This must have caused the expulsion, he believed.

Heat is created by work, and if it is conducted in summertime and especially in the hot months of April and May, even more heat is produced. Too much heat can be neutralized by taking food items which have a cooling quality (*tampu*), as the following case study illustrates.

CASE STUDY

M. tells us that she eats more curds and buttermilk during pregnancy because it is cooling. She is pregnant, she works in the fields, and it is summertime. Therefore too much heat is created and she needs more cooling food. When we asked whether she would have drunk more buttermilk and curds if she was pregnant in wintertime, she answered that if she had to work in the fields in the winter, then certainly she would have eaten more cooling things.

In summertime, many women in the last trimester of pregnancy reported to eat more cooling food items like curds and buttermilk. Women who have experienced many spontaneous abortions, stillbirths, or severely malformed children are believed to have a heating body constitution.

CASE STUDY

P. is pregnant for the fifth time. Her first pregnancy ended in a spontaneous abortion. The second and third pregnancy resulted in live births, but both children had severe malformations and died almost immediately after delivery. With the fourth pregnancy she had more luck: a healthy girl was born. P. mentions that she must be having a heating body constitution, because so many spontaneous abortions and 'wrong' children were born. During the current fifth pregnancy she drinks more buttermilk and curds in order to cool down her body.

Unfortunately however, this pregnancy also ended in a stillbirth. Women like P. who experienced many spontaneous abortions and children with malformations often take a special herbal medicine with cooling qualities to counterbalance the heat. The concoction is called *beevin rasa* and is juice made of neem leaves with water. It is taken every morning.

CASE STUDY

C. is pregnant for the fifth time. She has already lost three children: all three died within one month after delivery. They had severe malformations: one had hydrocephalus, another had spina bifida (*hunnu*). She tells us that there was too much *kaavu* for her during those pregnancies. During this pregnancy, a neighbour told her to drink *beevin rasa*, because it is *tampu* and cools down. She took this *beevin rasa* daily. In this case, the traditional medicine did work: C. gave birth to a very healthy child.

Although a spontaneous abortion being the ultimate consequence of too much heat, other effects are known. These are described in the following section.

Heating and effects on the health of pregnant woman. A few women in the sample (N=11) told us they avoid food items like papaya, sweet potato, jackfruit, pumpkin, *ginna* or

kekkerhannu because it would negatively influence their own health. If they eat these heating food items, there would be *baavu*: swelling and pain of the hands, legs or face of the woman. This food is also said to be *barsna*, which can be translated as an adverse effect, an allergy. This concept is explained in more detail on the next page.

Other factors determine whether these symptoms of too much heat in the woman's body occur: pregnancy itself does not necessarily evoke it.

CASE STUDY
During pregnancy, S. avoids pumpkin, sweet potato, fresh green chillis, and papaya because, as she says, they are heating (*kaavu*). This is the first time she does not eat them when pregnant. In earlier pregnancies she ate all these food items. When she became pregnant this time, she sprained her ankle, leading to a swelling on her foot. She went to a traditional healer in a village some thirty kilometres away and brought the five items needed to perform the *puja*: a coconut, arecanut, and betel leaf, incense sticks, and five rupees. The traditional healer treated her by placing a copper ring in S.'s ear and told her to avoid the food items mentioned above for five months.

Heating and leading to rashes or birthmarks on skin of the child. The same heating food items (papaya, sweet potato, jackfruit, peanut, sesamum, pumpkin) are said to lead to rashes, pimples or birthmarks on the skin of the child after delivery.

CASE STUDY
L. does not eat papaya during her pregnancy, because it is extremely heating (*bahale kaavu agatai*). If she ate it, a kind of burn (i.e. a birthmark) on the skin of the child, called *suttu* (a burn) or *suttid kale* (a mark of a burn) will result.

Besides birth marks, also pimples and other skin rashes on the skin of the child (after delivery), are known to be the result of the consumption of heating foods during pregnancy. Women mention avoiding jackfruit as it would lead to *charma* (pimples) on the skin of the child. Other women mention they avoid fresh green chillis or *kharpuddi* (chillie powder) because it would induce *mensin bakki*, a kind of prickly heat on the skin of the child. Again, the heating effect is more strong during summertime.

More often, however, women do not especially avoid this heating food during pregnancy. The effect on skin of the child is commented on only after delivery. An example: a woman showed her new born child and pointed at a big brown birthmark on the belly of the baby and said:

"I must have eaten too much jackfruit during pregnancy".

From this last paragraph, it becomes clear that women believe that what they eat during pregnancy not only affects health of the fetus and their own health, but also influences the

well-being of their children after delivery. In the next section, more examples of food items having an influence on health of the child after delivery are given.

***Barsna* and leading to illness of the child.** As mentioned above, there is a high consistency in beliefs about what kind of food should be avoided during pregnancy, though less agreement exists on the perceived consequences of consumption of this food. However, much agreement exists on the effects of banana and fresh coconut eaten during pregnancy. Banana (mentioned as avoided by 45.6 per cent of the respondents) and fresh coconut (mentioned as avoided by 65.2 per cent) are both *barsna*.

Barsna can be translated as an adverse reaction of the body, an allergy. Food is *barsna* during a specific period. During pregnancy, banana and fresh coconut are *barsna* for the child because they have an adverse effect on the body constitution of the child in the stomach, ultimately leading to illnesses after delivery. In the period of lactation, other food items are considered to be *barsna* (see Chapter 8).

All women associate banana and fresh coconut with illnesses of the child after birth. If they eat these food items, there would be too much *kapha* in the body of the child which leads to illnesses (after delivery) like colds, or coughs, and an illness called *hotte andu* (in one village also called *hottin bene* or *hotte rooka*). The symptoms of the illness are as follows: too much *kapha*, colds, and coughs (*kemmu*), raising of the belly under the ribs (*pakkadi*), breathlessness, fever, and fits. Ultimately it is believed to lead to death. A local doctor identifies the illness as pneumonia. Also sesamum and peanut are predominantly associated with colds, coughs, and *hotte andu*.

Banana and fresh coconut are commonly classified as *tampu*: they have a cooling effect on the body of the foetus (not on the body of the pregnant woman). If eaten, the child's body constitution is influenced: *kapha* (one of the *tridosha* in the human body according to Ayurveda; see Chapter 4) dominates in the body and provokes the above-mentioned post-natal illnesses. Moreover, the oil contents of sesamum and peanut, and also of fresh coconut, increases *kapha* in the body.

The illness *hotte andu*, evoked by food intake during pregnancy, can occur during the whole period of childhood. As stated in the Ayurveda, in each period of life one of the three *dosha* (*pitta*, *kapha*, *vata*) predominates. In childhood, *kapha* dominates and a surplus of this *dosha* in the body leads to illnesses like coughs, colds, and pneumonia (see also Chapter 4). According to some respondents *hotte andu* can occur even up to the age of 12. But again, other circumstances evoking the *kapha* disease are important.

CASE STUDY

B. tells us that her child developed *hotte andu* when it was nine months old. Indeed, she had eaten banana during pregnancy. But the child developed the disease under cold circumstances: the weather was quite cold and she had given it a cold bath. No wonder that the child, under these circumstances developed *hotte andu*.

During the interviews we were struck by a dilemma facing the mothers-to-be: in order to prevent too much *kaavu* during pregnancy (see above) they should eat more cooling things. But here, cooling food items have to be avoided because they are supposed to evoke colds and coughs, and *hotte andu* for the child. Discussing this with my assistants, they told me there are different kinds of cooling qualities. As seen in Chapter 4, in the section on Ayurveda, heating and cooling are attributes of food. But there are also six tastes: sweet, salty, sour, pungent, bitter, and astringent. When food is consumed, the first reaction of the body is taste. The next reaction of the body happens when food is swallowed and comes into the stomach: here the attributes, like heating and cooling, play a role. In this way, buttermilk and curds are different from banana. All three have a cooling effect in the stomach, but the taste differs. The assistants, for example, classify banana as sweet and cooling. However besides the cooling quality, especially the oil contents of food are believed to have an effect and to increase *kapha* in the body.

7.1.2. Extra food and likings

Although many ideas and rules exist about what kind of food should be avoided during pregnancy, very few exist regarding what food should be added in this period. As mentioned above, some women drank some extra buttermilk and curds in order to reduce heat.

A small number of women mention they eat more vegetables during pregnancy, but not for any special health reason: just because they like them. In addition, 11.4 per cent of the women (N=18) report consumption of more green vegetables during pregnancy. Here, too, the main reason mentioned is that they liked them more. Only few (N=4) associate this with improvement of health of either mother or child. Some say that by eating green vegetables the secretion of breastmilk increases. Given the fact that 36.6 per cent of all multiparae women breastfeed their previous child during pregnancy (see Chapter 5), it becomes clear that women consume more green vegetables not because of pregnancy but because of the milk lactation for the youngest child. Most women do not add anything extra or eat any special food during pregnancy and say:

"we just eat all things, except the food we have to avoid".

Several women mention that they just eat what they like and, of course, what is available in the household. This economic factor, availability of food in the household is one of the constraints on eating extra food. Others are distribution of food within the family and the dependency of women on others for provision of food items (see also Subsection 6.1.2). Many respondents say they would like to drink more milk, curds, or buttermilk during pregnancy, but there was either no cow or buffalo in the household or no money to buy it. The same can be said of fruit, to be bought at the marketplace. One of the respondents, when asked whether she liked to eating anything special during pregnancy, answered:

"what should I like? Even if I like something, how can I get it?? How can I buy it?? There is no money in the house".

But even if economic circumstances are more favourable, pregnant women eat whatever the family eats. In an interview with one of the women in her mother's place, the respondent tells us about her nutritional behaviour in her husband's place:

"... there I eat just what everyone else in the house eats".

On inquiring whether she ate anything special during her pregnancy, her mother reacted:

"What do we have to eat special??? She is living in her husband's house: so, what extra can she eat?? Even if she wants something special, the husbands family has to give it to her".

As we saw in Chapter 5, many women remark that at their mother's place they eat better food than with their husband.

Some beliefs prevail about food having a special effect on the child. In a society where a light coloured skin is highly valued, several food items are known to lead to such a fair complexion. These food items are either badaami wheat (to be bought in a package from the market and mixed with milk), or saffron mixed with milk or cumin (*jiirge*) with aniseed (*badesoppu*). Another custom mentioned by respondents is pica and geophagia, i.e. the consumption of items like mud (*mannu*), charcoal (*iddali*), sacred ash (*vibhuti* and chalk (*matti*) during pregnancy.

Special likings (*baike*), consumed by women during pregnancy, consist of sour things like raw mango (*mavinkai*), pickles (*uppinkai*), raw fruits (*kai*), cucumber (*sautekai*). Also vegetables and fruits like sweet lime (*mosambi*), grapes (*draxi*), and apple (*seebu hannu*) are mentioned.

7.1.3. Social norm regarding quality of food intake

Given the beliefs of the respondents, attitudes are furthermore constituted by the subjective norm: the beliefs of important others and motivation of women to conform to them. With regard to beliefs on quality of food intake during pregnancy (in contrast with quantity of food intake, see Subsection 7.2.5), the beliefs of others play an important role. When respondents were asked who had told them to avoid certain food or to eat something extra (more than one answer was possible), 43.7 per cent mentioned their mother-in-law, while 44.3 per cent mentioned their own mother. Others consisted of the neighbours or village people (mentioned by 26.6 per cent), elders in the family (mentioned by 12.0 per cent), and other female members of the family (10.8 per cent). 14.6 per cent even reported the husband or father-in-law. Very few (N=3) mentioned a medical doctor or nurse.

The group of important others consisting of village people and neighbours indicate that beliefs about what should be avoided during pregnancy is common knowledge. And not necessarily a belief incorporated by the respondents themselves. This is illustrated by sentences very commonly used in the interviews:

A: "when you are pregnant, **as they say**, one should not eat banana, fresh coconut, sesamum, ...
T: what about papaya?
A: I did not eat: all is *barsna*, **as they say**".

The mother of one of our respondents, present during the interview, explains that her daughter should not eat banana and all other food mentioned, and adds:

"this is what our ancestors did, we are just continuing it".

As expected, the mother-in-law is one of the important others. But a respondent's own mother also plays a major part: women are influenced by their mothers during the first pregnancies

when they come home for delivery. One of the related factors is the type of family a woman lives in. The difference is illustrated in the following case study.

CASE STUDY

While interviewing a group of women in the Harijan street in Mugad, two women mention all the food items they avoid during pregnancy. Two others tell us they just ate everything. Asked about the difference, one of the women who does not avoid anything says:

"... well they are living with the elders and have to obey them. But, me ... I am only living with my husband and can eat what I want. No one told me not to eat!!"

She explains further that during her first pregnancy she, too, did not eat banana and papaya. At that time, her mother-in-law was still alive and told her not to eat these food items. When her mother-in-law died and she became pregnant for the second time, she ate everything.

Among women living in a joint family, the majority (40.2 per cent) mention first of all being influenced by their mother-in-law (while still 29.2 per cent mention their own mother). Among women living in a nuclear family, more say they are influenced by either their own mother (24.4 per cent) or neighbours (20 per cent). Also the husband plays a more important role: of all women who mention their husband, 63.2 per cent live in a nuclear family. Still, 11 per cent were influenced by their mother-in-law. And although some could be influenced by her because she lives nearby in the same village, even in the same street, most of these women were influenced by their mother-in-law during an earlier pregnancy when they lived with their parents-in-law. Due to the death of the parents-in-law or a separation, they now live in a nuclear family.

Here, we come to another background variable: parity. Most influence takes place during the first pregnancy. Many first gravida women appear to know what kind of food they should avoid but do not know why. They are just told to avoid these items.

CASE STUDY

N: "this is my first pregnancy, my mother and mother-in-law told me not to eat banana, coconut, ... I do not know why".

In another interview, we ask a zero parity woman about her food intake during pregnancy and her mother answers:

CASE STUDY

Mother: "... what does she know about pregnancy? It's her first one. She has no experience".

Of course, there is a relationship between the two background variables type of family and parity (see also Chapter 5). After marriage, women start to live with their family-in-law and most zero parity women (92.9 per cent) live in a joint family (see Chapter 5).

While the mother-in-law and mother are the most important persons influencing the respondent with regard to quality of food intake during pregnancy, motivation to conform to either or both of them differs. Obviously, women in joint families are more motivated to conform to their mother-in-law, where they live and spend most time of their pregnancy.

CASE STUDY

When we interviewed S. in her mother's place, she told us that during pregnancy she ate everything in her husband's place. Her mother, present at the interview, mentioned that she should not eat papaya and banana, etcetera. To our question

"but S. did take these food items during pregnancy, is it not?"

S. reacted:

"I am living in that place (husbands), not here!!"

The influence of the background variable parity can be illustrated nicely by another case study.

CASE STUDY

When we went to conduct an in-depth interview in Mugad, not only our respondent (S.) appeared to be present in the house, but also her mother-in-law (A.) and the latter's daughter (K.) who is pregnant in her last month and had come home for delivery. Our respondent S. (23 years old) told us that she eats everything during pregnancy, except papaya which is not available in this period.

The daughter K., living in another village with her in-laws told us that she avoided banana, fresh coconut, and sweet potato. Her mother-in-law and husband had told her to avoid them. Her mother A. agreed that K. should avoid them during pregnancy.

We wonder about this difference: A. tells her own daughter she should avoid certain things, but her daughter-in-law who lives with her, does not avoid them. On asking what the difference is between the two women S. first tells us:

S: "I am more free, I have independence in the house, and there are no guidelines given by elders".

And her *atte* adds:

A: ".... she (S.) already has three children".

It is clear that women who are pregnant for the first time and who live with their parents-in-law conform to the ideas of that family, especially those of the mother-in-law. After the marriage is consummated a woman has to prove her fertility by becoming pregnant, the sooner the better. Her status is reinforced by giving birth to a child and certainly during pregnancy she tries to prevent a spontaneous abortion. In addition, she takes care to prevent any future illnesses for the child, or she might be blamed for it later on. Therefore, she is definitely more obedient and does things her mother-in-law tells her to do (or at least pretends to do, as we will see later) than higher parity women. Women of higher parity, and certainly S. who has already given birth to two boys, are more free and are less dependent than women of first parity.

7.1.4. Summary

The information gathered indicates that for pregnant women, first of all it is important to prevent a spontaneous abortion, stillbirth or malformation by avoiding too much heat. Too much heat can be created by either food, summer season, hard work, allopathic medicines or sexual intercourse. Furthermore, the body constitution of the child is influenced by nutritional behaviour of the mother. If she eats too much banana, fresh coconut, or sesamum, it results in too much *kapha* in the body of the child, inducing illnesses like pneumonia, cold, and cough after delivery. Moreover, it is clear that pregnancy is seen as a period in which some food should be avoided, but not so much as a period in which food should be added. In Chapter 8 we will see that the period after delivery is seen as a period in which a woman needs extra food. In addition, we found that most women are either influenced by their mother-in-law or mother, especially during their first pregnancy.

One can wonder whether women with an intention to avoid papaya actually do so, given the fact that papaya is available only during some months of the year. Moreover, it is not affordable for many people. In the same way, few women say they avoid non-vegetarian food at the end of pregnancy, but in the villages not much meat is eaten anyway, because it is too expensive. Also, *ginna* -the sweet made of the colostrum of cows or buffaloes- will not often be present in a household. But it might be eaten more often than expected, because it is a delicacy to be shared with other people.

On the other hand, people might have an intention to avoid banana because it results in illnesses for the child. But it is one of the few fruits available and affordable, and women might eat it more often than expected based on the reported beliefs. For in the research project with different surveys it was possible to find almost all women in the nutritional survey stating they avoided banana during pregnancy, where as from the interviews it became clear that more than 50 per cent actually ate it. The opposite was also noticed. In the interviews some women told us they avoided banana, while in the nutritional survey, they were observed to eat banana. Thus, avoidance of a certain food item not always means a total avoidance. Several respondents made clear that a little bit of banana does not have a bad effect on the health of the child, but too much certainly would.

The same problem, knowing whether women indeed really do what they say they do or should do, applies to the influence of important others. In a social context where showing respect to elders is very important (see also Chapter 4) it is difficult to obtain accurate information

about whether women really do as they say and conform to their mother-in-law or others. Two case studies illustrate how individuals in this kind of social context find their own way.

CASE STUDY

The case study pertains to an interview with L. The interview was conducted in her parent's house. She said that her mother-in-law told her to avoid banana, etcetera during pregnancy. But well, actually she ate them. She tells us, giggling, that her mother-in-law did not see her eating it. Her husband, who is present at the time of the interview, clearly does not like it that L. did not listen to his mother. A daughter-in-law should obey her mother-in-law or at least should pretend to do so. Eating these food items in secret is okay: the husband had in fact brought the banana from the market for his wife. But, she should not openly admit it, and certainly not boast about it.

CASE STUDY

In the interview with K. she said she does eat banana, etcetera during pregnancy. We asked whether she, like other women, believed that it would lead to illness of the child or not. She said she just eats everything and does not bother. At that moment, an elderly lady (family member) came in and listened to us. Then, K. suddenly starts to use sentences like

"one should not take banana"

and

"they say one should not take ...".

In this way, K. paid respect to the elderly lady, and pretended that she avoided these food items during pregnancy although in reality she did not.

Thus, women definitely do eat some of these food items. But maybe only in small quantities. Because if her child becomes ill or dies due to a cold or cough or *hotte andu*, people definitely say, as occurred in one case:

"it is because she ate banana during pregnancy".

Women who have to establish their status in a new family, who have to prove their fertility and who are dependent (thus especially first gravida women) certainly do like B. did:

B: "it is better not to take any risks, it is just a precaution" (not to take banana, etcetera). It is better to observe the rules for if the child becomes ill, we will be blamed for it".

7.2. Beliefs about the quantity of food intake during pregnancy

Asked how much they ate during pregnancy compared with their normal food intake, most women (54.4 per cent) mentioned that they ate the normal amount during the first months of

pregnancy and less than normal in the last trimester. More than 30.0 per cent claimed that they ate normally during the whole pregnancy. Another 12.0 per cent stated they ate less during the first months and normally afterwards. Only seven women claimed to have eaten more during pregnancy. With respect to these statements about the amount of food eaten during pregnancy and differentiating them for different months, the distribution of women is as given in Table 7.2. The use of month 9-10 can be explained by the fact that women in the villages count their months of pregnancy according to new moon (*amawasya*) or full moon (*hunnime*). A pregnancy in their view thus lasts ten lunar months, but often delivery is expected to take place before ten months are over.

As can be seen in Table 7.2, from month six of pregnancy onwards more women claim to eat less. In the last months, the percentage amounts to 54.4 per cent (N=86). The percentage of women eating normally in these last months is 42.4 per cent (N=67).

Only a few women (N=7) stated that they ate more than normal during pregnancy, as international standards recommend. They reported to be eating one or one and half rotti more every meal during pregnancy. Asked why they ate more, they mentioned that either they "liked to eat more" or "were just hungry, so ate more".

Those women who stated they ate less during the first months of pregnancy had nausea and could not eat their normal amount of food. Afterwards, they started to eat as normal or sometimes ate less again at the end of pregnancy.

Indeed, more than half of the respondents claim that they ate less at the end of pregnancy. As one key-informant, the night-school teacher in the village of Devarhubli, tells us it is regarded as quite a common feature:

> "the doctor says: eating more is better during pregnancy. The woman will feel better. But in daily life in the village women do not eat more. The longer the pregnancy —close to ten months—, the women will eat less".

Table 7.2. Number and percentage of women stating to eat normal, more or less than normal in different months of pregnancy (N = 158)

	Month of pregnancy					
Food intake	1-4	5	6	7	8	9-10
More	3 1.9%	6 3.8%	7 4.4%	7 4.4%	6 3.8%	5 3.2%
Normal	96 60.8%	100 63.3%	95 60.1%	83 55.1%	73 46.2%	67 42.4%
Less	59 37.3%	52 32.9%	56 35.5%	64 40.5%	79 50.0%	86 54.4%

Women claiming to eat less during the last months of pregnancy indicate how their food intake changed. Some of them spoke about a slow decline in food intake over the whole pregnancy:

"... daily daily I take less (*dinaa dinaa kadime*)".

Others changed their meal pattern: instead of two meals and a *tiffin*, only two meals per day were taken or instead of full meals more tiffins were taken. Others indicated a change in the number of *rotti* taken per meal.

In the following subsections, two groups, i.e. women claiming to eat normally (N=67) at the end of pregnancy and women claiming to eat less at the end of pregnancy (N=86) are used for the analysis of beliefs about quantity of food intake during pregnancy. The few women who said they ate more are left out.

7.2.1. Reasons not to eat more

After the statements about the amount of food eaten in the different months of pregnancy, we subsequently asked the women why they did not eat more during pregnancy (as international standards recommend). The almost standard answer was:

"if we eat more, we women will have problems (*namge tras agatai*)".

Different kind of problems could be identified. The perceived consequences of eating more during pregnancy are presented in Table 7.3. Many of these perceived consequences are related and are presented accordingly in the most logical order. We emphasize that these are the first reasons mentioned by women why they do not eat more, ergo why they eat normally or less at the end of pregnancy.

We will have problems (*namge tras agatai*). A large proportion of the women, those eating less as well as those eating normally, answered that by eating more during pregnancy women will have problems (*namge tras agatai):*

G: "when we are pregnant, we are with two..... if we eat more namge tras agatai...".

This consequence is rather important and is mentioned more often in this chapter. It indicates that first of all women do not eat more because it affects their own feelings of well-being.

Acidity (*hulsudu*). *An item mentioned especially by women who said they ate less during the last months of pregnancy is acidity: hulsudu (or huli).* Due to acidity, women do not feel able to eat more. The perceived etiology of acidity is an interesting one. As S. says she eats less after five months of pregnancy:

S: "You know why I eat less?? ... the child is there, it has a lot of hair: then there is *hulsudu* and therefore I eat less".

Women believe acidity starts because the foetus has a lot of hair all over its body. A private doctor with a nursery in Dharwad, which is often visited by village women, explained that she anticipates this belief and prescribes tonics against "the hair of the baby". The local remedy against *hulsudu* is application of *sunna* (lime, commonly chewed with arecanut and betelleaf) on the outside of the throat. A few women say they drink milk, buttermilk or curd against acidity.

Table 7.3. Reasons not to eat more during pregnancy

Reasons not to eat more during pregnancy	Mentioned by number and % of women (claiming to eat **less** in last trimester)		Mentioned by number and % of women (claiming to eat **normally** in last trimester)	
we have problems (*namge tras agatai*)	52	60.5%	27	40.3%
acidity (*hulsudu, huli*)	38	44.2%	16	23.9%
breathlessness etc (*ekase*)	33	38.4%	17	25.4%
no capacity (*khapsu dilla*)	30	34.9%	6	9.0%
stomach pain because of a full stomach	28	32.6%	16	23.9%
vomiting	27	31.4%	18	26.9%
child is there: not possible to eat more	20	23.3%	8	11.9%
no digestion	19	22.1%	7	10.4%
not being able to work	18	20.9%	3	4.5%
just not feeling like eating more	17	19.8%	9	13.4%
eating like this: just good for mother's health	16	18.6%	23	34.4%
just cannot eat more	14	16.3%	10	14.9%
feeling tired / bored (*aiasse*)	14	16.3%	3	4.5%
child will not move	12	14.0%	8	11.9%
child will not move: we have problems	11	12.8%	6	9.0%
no strength (*shakti*)	8	9.3%	2	3.0%
circumstances	4	4.7%	4	6.0%
child will be small			3	4.5%
no food available			2	3.0%
distribution of food in the family			2	3.0%
child will be big				
	N = 86		N = 67	

No digestion / *khapsu dilla* / no strength (shakti). Many women, and again especially those reducing their food intake, mentioned they ate less because *khapsu dilla*. *Khapsu* was often translated by the assistants as 'capacity' but a better translation is digestion. During the last months of pregnancy, there is no digestion and women could not eat more. Another word for digestion is (*pachana*).

M. who eats one whole meal less after five months of pregnancy, says:

M: "there is no total digestion (full *khapsu dilla*)".

And S. who states to eat a little bit less (no full meals) after five months of pregnancy says:

S: "If we eat full meals, then there are problems: there is no digestion. (*naavu full oota maartewe ... tras agatai: khapsu dilla*)"

And one of the respondents who says:

A: "if there is more *khapsu*, more food can be taken; one takes food according to her *khapsu*"

relates it further to *shakti* (strength). If there is more *shakti*, then there is more *khapsu* and one can eat more food. More women mention this relationship between *shakti*, *khapsu*, and food intake. The general idea is that women who are less healthy (*ashakti*) have less *khapsu* and as a consequence eat less. While women who are more healthy (*shakti*) digest the food more easily and thus can eat more. *Shakti* is believed to decrease with age: during a lifetime *shakti* becomes less and less. Women of higher parity state they ate less during this pregnancy: less than normal and less compared with their former pregnancies, as the following case study illustrates.

CASE STUDY

T: "She also says: during the first pregnancy, there is more *shakti* for women. During that pregnancy she could eat more. But during her second pregnancy: there was less *shakti* and she ate less food. During the third: again there was less *shakti* and again she ate less compared to the second".

I: then, why is that??

T: there was *ashakti*: she lost her capacity for meals".

One of the key informants, again the nightschool teacher in Devarhubli also mentions this decline in *shakti* and thus food intake with parity, but associates it with too short intervals between the subsequent pregnancies:

"Suppose you had a delivery and your strength is less: if you take pills on the proper time, you can not become pregnant. Then there is more time and there will be development of the woman, she can become strong again. But that is in the cities .... It is not like that in the village".

A special case, concerning a woman who ate less because she had no *khapsu* due to possession by an evil spirit is presented on page 178.

***Ekase / aiasse* / vomiting.** Many women reported that if they ate more, *ekase* would occur. *Ekase*, a typical village Kannada word, is not included in the standard Kannada-English dictionary written by Kittel (1894). The Mysore Kannada word *kakassa*, however, seems to reflect the same idea as it is described as "trouble (heavy breathing etc) arising from an overloaded stomach, from running fast etc".

In the villages, *ekase* indeed is associated with eating too much. One of the research assistants describes *ekase* as a problem (pain) occurring between the heart and the stomach, i.e. the chest. Also a doctor in Dharwad, often consulted by villagers, said that all kinds of problems located in the chest are called *ekase*. The respondents mention symptoms like a feeling of heaviness in the stomach because both child and food are there, acidity (*hulsudu*), breathlessness, heart beatings, no digestion, gas problems, vomiting, feeling tired and dull (*ayasa*) and not being able to work and walk freely. *Ekase* occurs when one eats a lot of food. As one of the respondents explains:

".... 1.5-2 hours after having meals *ekase* occurs. *Ekase* means some problems: not being interested in working or in doing anything".

Everybody can have *ekase*. Among pregnant women, however, it occurs sooner because the child is there in the stomach.

Child is there and cannot eat more / stomach pain because of a full stomach / just cannot eat more / do not feel like eating more / eating like this is just okay for health of the mother.
As mentioned above, pregnant women develop *ekase* sooner because the child is there in the stomach, as the following case study indicates:

CASE STUDY
I: "How much do you eat in month ten of pregnancy?
G: In month ten: I eat less (*kadime*)
I: why do you eat less?
T: more eating during pregnancy, the child is heavy, they two (mother and child) are heavy ... then eating more ... *ekase* starts".

In the interviews, women appear to mention often:
"The child is there in the stomach, THEREFORE I eat less".

Here we should explain that in local Kannada a pregnant woman is addressed as *avulu hottilli adaale*, literally meaning 'she is with a stomach' (*hotte*). A spontaneous abortion is called *hotte hoitu*: 'the stomach died' or *hotte mugitu*: 'the stomach has finished, has stopped'. A woman who went to hospital where they discovered a severe malformation of the foetus and an abortion was induced said that her 'stomach was washed'. Also food is goes to the *hotte*. Nichter and Nichter (1983) report that women believe that both food and child are in one and the same place: the stomach. Many of our respondents did not have any idea where the child was or where the food was in the stomach. As one of the poorer respondents says laughingly:
"how do we know?? we are no doctors! we just work and eat, that is it".

Some believed the child and food to be together in one place. But quite a few mention that the child is in a separate place: in the *kusin chilla* (literally: 'bag for the child'). Educated women also mention the Sanskrit word: *garbha kosha*. But in general, the part of the body where the stomach, belly, and uterus are located all together is called the *hotte*.

Women claim to eat less, or not to eat more, because the child is in the stomach. A traditional birth attendant clarifies this further:
"The child is growing; growing especially at the end of pregnancy. And therefore, ... daily daily .... pregnant women eat less food".

The child is believed to be completed after five to six months and to start to grow. As pregnancy progresses, more and more space in the stomach is occupied by the child and less place is left for food. Some women explicitly say that at the end of pregnancy the child is big:
"if the baby is big .. it occupies more place ... then, if eating more, we will have stomach problems".

This is an important statement, indicating a reversed relationship between food intake and size of the child. As literature states that women in developing countries eat less because they do not want a big baby, here women state that **because** the child is big at the end of pregnancy, they eat less. If more space is occupied by the child, logically there is less room for food.

The statement that women eat less because the child is there, must further be related to the idea which is highly prevalent in society: one eats until the stomach is full.

If they eat too much and the stomach becomes too full, problems like pain or tightness of the stomach are reported. In the same way, women say they just cannot eat more:

"If I eat the normal amount of food: I am full. I cannot eat more. I do not feel like eating more".

CASE STUDY

"The doctor told me to eat more fruit, *rotti*, rice, and vegetables. It would be better for the blood ... better for my health and also the child is developing better. But we do not eat more: it cannot be controlled. How much a stomach can take, that is sufficient".

Some women, when asked why they did not eat more during pregnancy, even became angry and replied that they just could not eat more. And women say that eating like this, less or normal, is just okay for the health of the mother.

Child will not move / child will not move and WE will have problems / child will be small. While the child is there in the stomach and occupies more and more space as pregnancy progresses, eating too much leads to *ekase* and stomach pain. But eating too much would also mean that no room is left for the child to move or rotate. Eating less, makes it possible for the child to rotate.

H. who states that she takes the normal amount of food during pregnancy says:

"When the child is there, it's moving; if it stops, then we leave the meals".

If the child does not move, in the first place, the mother is believed to have problems:

R: "Eating less, then we do not have problems and the child turns around. And if the child moves: WE have no problems".

A few women, all of them claiming to eat the normal amount of food at the end of pregnancy, say they did not eat more because then the child would be small. No rotation and the child being small are related to each other as will be discussed in detail in Subsection 7.3.2.

***Ayasa* / not being able to work and walk freely**. Several women, especially those eating less during pregnancy say they did not eat more because then they would not be able to work and walk freely. *Ekase* is associated with this factor, as R. explains:

"Eating more, *ekase* occurs. We feel tired, like to sleep and sit and are not able to do the work. And in our husband's house we have to work ... Eating less, there are no problems and we just work more and better".

Also the other factors mentioned above are related:

"the child is there in the stomach .. and gives too much weight ... eating more food makes it more heavy: we cannot work and walk freely".

A birth attendant illustrates this last argument further by showing how difficult it is for a pregnant woman who has a 'tight stomach' to bend and cut the rice. And especially the women in the lower economic classes cannot afford not to work in either the fields or stone quarry: they have to earn an income (see Chapter 5).

One of the respondents ate a gruel (*ganji*) of barley rice during pregnancy: she says it was easy to digest and light for the stomach. Taking it, she had no heavy stomach and could do the work she had to do.

Circumstances. Economic circumstances were mentioned by a few women (N=3), all stating they ate as normal:

"how can we eat more: we are poor people".

For women who stated they ate less at the end of pregnancy, this economic factor did not play a role at all. This is easy to understand: women say they eat less because of pregnancy. Among the household members, they are the only ones who eat less while all others consume the normal amount.

The fact that women do not eat more because they will not be able to work and walk freely however has an economic angle. Women of lower economic classes have to work outside and earn a living.

CASE STUDY

A., a Muslim woman, states that during her earlier pregnancies she ate less. But, now during her third pregnancy, she eats all the things she wants to eat. Why the difference? A. says that during the earlier pregnancies, there were many people in the household (her husband's mother, his brother and wife) and in those circumstances, as she says:

"I could not eat freely".

The other people left however, for Goa in order to work there, and as M. continues:

"Now we are with two in the house, my husband and me. Now I am pregnant, and he gives me ... what I like to eat, hence I can eat".

A few women mentioned they did not eat more because of the **distribution** of food in the family. As the mother of one of the respondents says (a quarrel was going on between the families and the respondent fled from her husband's house):

"how could she eat more; there the first preference is given to the husband".

A factor related to this social and psychological control within the family, is illustrated by the aforegoing case study. This case study illustrates a more psychological aspect regarding the amount of food eaten during pregnancy. Due to social control and mental pressure from other people in the household, this woman did not feel free enough to eat whatever she wanted. This factor is more important in joint families than in nuclear families and also varies with parity. As already explained in Section 7.2, women who are just married, who have to get used to a new family and have to prove their fertility, definitely experience more psychological pressure.

Other circumstances affecting women with regard to the amount of food intake are the following.

- in the summer season it was considered to be too hot to eat a lot of food;
- an accident with a child, worries about his health and a consequent long stay in the hospital prevented a woman from eating much during this pregnancy; the death of a child due to an accident affected another respondent in the same way.

A special case is the one of S. who stated she ate less during the last months of pregnancy, because there was no *khapsu* due to *gaali* or *devva*.

CASE STUDY

S. tells us that when she was pregnant in the sixth month, her husband's uncle died. S. was very fond of this uncle. But when he died, she and her family did not take enough care, and she was affected by *gaali* or *devva*: she was possessed by the spirit and was unconscious for some hours. Then she started to move again on her own. After this incident she felt very weak (*ashakti*): she had no *khapsu* and she did not eat much.

Gaali in Kannada is 'wind' or 'air', but also means a demon or an evil spirit. Besides *gaali* also *devva* is used (also *bhuta*, often translated as ghost or spirit of a deceased person). All are malignant spirits but each has another connotation. One of the respondents explained: *devva* is always present, everywhere in daily life and *gaali* is an evil spirit that inflicts very suddenly and one is very scared of it. Most *gaali* and *devva* are present in the night time and six hours after dawn, at the heat of the day. This is one of the reasons why children are not taken to the fields. Possession by a spirit leads to un-consciousness, trembling and screaming. As an assistant told us, a person possessed by a spirit should go to the priest who finds out who the evil spirit is and advises what has to be done to get rid of it. For example, a *puja* must be performed or *mantras* recited. Only when this has been done, can one get better. People are very scared of evil spirits. Pregnant women and more so wet mothers and young children are especially vulnerable to their influence (see also Chapter 8).

In this case, it was said, the family had not taken enough care: S. was not protected enough against possible influences of evil spirits. As the assistant who lives nextdoor says: "S. was fully neglected" because a quarrel was going on in the family and recently T. and her husband separated from the main family. In that situation, S. was more vulnerable.

Big child. None of the women stated that they did not eat more as they feared the child would be big. The idea that women eat less during the last trimester of pregnancy because the child will be too big and this would lead to a difficult delivery is not at all confirmed here. On the contrary, women say the opposite: because the child is big at the end of pregnancy and occupies more space, they eat less.

Conclusion. Given these perceived consequences of eating more, which are the first reasons mentioned by women why they eat as normal or less at the end of pregnancy, it is clear that in the first place women do not eat more because it would affect their own health and feelings of well-being in a negative way. If they eat more, problems like acidity, *ekase*, indigestion arise. As the following case study nicely illustrates:

CASE STUDY
"if we eat more, then WE will have problems; for the child there are no problems!! *(Hechchige oota maadtewe, namge tras agatai; kusige tras agudilla)*".

7.2.2. Perceived consequences of amount of food intake for the child

In the interviews, after having discussed the different reasons for not eating more during pregnancy, we subsequently focused on the perceived consequences of the amount of food intake for the child. Women indicated that they did not eat more at the end of pregnancy because they would have problems with their own health. But what did they think would happen to the child if they ate more and what would happen to the child if they ate as they did, either normal or less?

Perceived consequences of eating more for the child. In Table 7.4, perceived consequences of eating more for the child are presented. Answers given to the question "what would happen to the child if you eat more during pregnancy?" were tallied: more than one answer was possible.

Only a few women believe that eating more during the last trimester would lead to a **big or more healthy** child. Although they said that it would be better for the child to eat more, they do not do so because they themselves would have problems like *ekase*.

CASE STUDY

I: "How much do you eat during pregnancy?
G: In month six of pregnancy, less
I: Why do you eat less?
T: If eating more ... during pregnancy the child is heavy, they two are heavy ... if eating more: *ekase* occurs
G: if we eat more, that is good for the child (*jaasti oota maadtewe ... chello kusige ...*)
I: and eating less ...
G: the child will be weak ... but it is God who gives ..."

We already saw in the last subsection that women said they did not eat more because then the child would **not move**. Here, more women (10.5 and 9.0 per cent respectively) indicate this consequence of eating more: there would be no space for the child to rotate in the stomach. Some women associate this lack of possibility for rotation to the size of the child. If the child is not able to rotate, it will be small. 19.7 per cent of the women who said they ate less during the last trimester of pregnancy and 13.5 per cent of those who said they ate normally, indeed relate eating more to a **small or less-developed** child. A traditional birth attendant illustrates this notion with a beautiful example:

CASE STUDY

Y: "If you eat much during pregnancy, the baby will be small (*sannu*)
I: Then, how can it be: eating more, a small baby?
Y: (pointing at a bag with just harvested paddy). You see this bag full of paddy? It's full: all the grains are packed together within the bag. If there is a child, how would it look? Does it have any space to develop??"

However, the majority of the women state that eating more would **not** have **any effect** on the child and they do not relate eating more during pregnancy to a big or small child. The high percentage of women mentioning this, can be explained by the fact that a question about consequences of a behaviour which is not conducted (i.e. eating more) is much more difficult to answer than one about actual behaviour. The higher percentage of women claiming to eat as normal and not knowing what will happen to the child, might be due to the fact that women eating less than normal are much more aware of eventual consequences for the child than women who do not change their food pattern and eat just as normal.

Perceived consequences of eating less or normally for the child. After having posed the question what would happen to the child if more is eaten, we asked women what the effect would be of not eating more. In other words, what would the effect be on the child if less or the normal amount is eaten. Percentages are given in the Tables 7.4 and 7.5. Again, here more than one answer was possible. Very few women say if they eat less or normally, the child will be **small**. Here, too, we can remark: these women mention that this, however, was not the reason to eat less:

CASE STUDY

"If we eat less, then the child will be small. But I cannot eat more. If I eat more, there is no digestion, I have to vomit. That's the reason I eat less: not because the child will be small".

Quite a high percentage of women (respectively 26.3 and 22.4) believe that if they eat as they do during pregnancy the child has more space to **move around** in the stomach.

CASE STUDY

T: "she says: if the stomach is full, then there is no rotation of the baby.
I: aha, how is the baby rotating?
T: when the stomach is empty".

Rotation is not only considered to be good for the child but also for the woman:

Table 7.4. Perceived consequences of eating more for the child

	Mentioned by number and % of women (claiming to eat **less** in last trimester)		Mentioned by number and % of women (claiming to eat **normally** in last trimester)	
If you eat more:				
Child will be big	4	4.7%	4	6.0%
Child will be small	7	8.1%	6	9.0%
Child will be less-developed	10	11.6%	5	7.5%
Child will be healthier	6	7.0%	1	1.5%
Child will be just normal	5	5.8%	-	
No effects on child	38	44.2%	24	35.8%
Child will be *arama*	2	2.3%	1	1.5%
Child will not move	9	10.5%	6	9.0%
Do not know	5	5.8%	14	20.9%
	N = 86		N = 67	

Table 7.5. Perceived consequences of eating normally or less for the child

Reasons not to eat more during pregnancy	Mentioned by number and % of women (claiming to eat **less** in last trimester)		Mentioned by number and % of women (claiming to eat **normally** in last trimester)	
If you eat less / normal:				
Child will be big	5	5.8%	1	1.5%
Child will be small	4	4.7%	3	4.5%
Child be well-developed	12	14.0%	3	4.5%
Child will be healthier	22	25.5%	17	25.4%
Child will be just okay	11	12.8%	16	23.9%
No effects on child	12	14.0%	7	10.4%
Child will be *arama*	31	36.0%	25	37.3%
Child will move	23	26.7%	15	22.4%
Child moves, more developed	9	10.5%	3	4.5%
Do not know	7	8.1%	11	16.4%
More space for child	4	4.7%	2	3.0%
	N = 86		N = 67	

CASE STUDY

I: "why do you eat less?
A: (if I eat more), there will be problems for us (women)
I: what kind of problems?
A: the child will not turn around. When I eat less, I feel very well. And if the child turns, the child is also okay".

However, there is a limit: if not enough food is eaten women complain about the child kicking too much, giving them a feeling of being unwell. If they eat a small tiffin at the moment when the child worries them, the kicking stops.

Rotation or movement of the child is an important signal for the respondents. If the child moves, women know that everything is okay. Women believe the child is completed at month 5-6 of pregnancy and then starts to grow and rotate. Several respondents told us that they were worried around the sixth month of pregnancy because they could not feel the child moving and they went to hospital to check whether everything was okay.

Especially women who claimed to eat less at the end of pregnancy, believe that the child will have more room to rotate and as a consequence will be **better developed** (23.6 per cent) or **big** (only 5.9 per cent).

B. from Mandihal is one of the few women believing the child will be big if eating less:
B: "eating less, the fatter the baby".

Better developed is not the same as being big. The difference between the two is quite important. The following case study illustrates the difference:

CASE STUDY
N. tells us that she ate less during the last two months of pregnancy. She had problems like *ayasa* and acidity. When asked about the effects of eating less on the child, she tells us that the child will develop well. In Kannada, *kusu beelitaite*: 'the child will grow like a crop in the fields'. Only if nothing is eaten, does she believe the child will be weak. However, the red tablets given by the local nurse, those she did not take: for the child will be big or fat (*pushti*), and lead to problems at the time of delivery.

This is quite an important difference: eating less makes it possible for the child to develop well, while iron tablets are believed to lead to a big and fat child, giving problems at the time of delivery.

Most women, and especially those who stated they ate normally, explain that if they ate the way they do, i.e. normally or less, the child will be **just healthy**, will be **just okay**, will be **aram** (fine, okay).

CASE STUDY
"if I eat more, the child will be thin. If I eat less, the baby will be normal. The child will be *chello* (good), *arama* (fine)".

Again there is a relationship between rotation in the stomach and being healthy. A child which moves in the stomach, that's a healthy child:

CASE STUDY
K: "if I eat less, I am healthy; the child is nicely moving and is also healthy (*arama*)"

Some women say that their actual amount of food intake does **not** have **any effect** on the child. They do not see any relationship between food, the size or health of the child. One of the respondents said that eating less after six months of pregnancy would not have any effect on the child:

"The child is completed at six months and healthy and big, and eating less does not have any effect".

On asking another woman who said she ate less at the end of pregnancy what the effects would be on the child: would the baby be small or big or normal?, she reacts indignantly to the question:

"how can it be, it is natural. It is God's blessing whether the child will be big or small. It does not depend on food".

And again another respondent stresses that food does not affect the size of the child, but iron tablets do.

CASE STUDY

A: "there is no relationship between food and the size of the baby. When I went to the hospital, they gave me tablets. If I take the tablets, the child will be fat (*dappa*). So, I did not take those tablets. But eating meals, that will not affect the size of the baby, it will not become big".

Conclusion. Given these perceived consequences of quantitative nutritional behaviour for the child, we first conclude that almost no women believe that if they eat more, the child will be big. On the contrary, more women said that if they ate more the child would be less developed or even small because the child is not able to rotate. Eating less or normally is related to the possibility for the child to rotate and especially women who state they ate less relate this to a child which is well-developed. In brief, all women believe that how they eat during pregnancy, less or normally at the end, leads to a healthy child. Thus: women perceive a relationship between food and size of the child, but it is not the commonly known one.

In the in-depth interviews, still keeping the literature in mind where it is said that women eat less because they want to have a small child, we double checked the information by asking another question. Would the women like to have a small or big baby at the time of delivery?

7.2.3. Preference: a big or small child?

We asked women what they would like to have at the time of delivery: a big child or a small child or any other child? The first reaction of almost all respondents was laughter and giggles. The answers given are presented in Table 7.6. Again, more than one answer was possible: women for example could indicate they wanted a small child but actually it was up to God.

More women (respectively 27.9 and 22.4 per cent) answered that they wanted to have a big rather than a small child at the time of delivery. A **big** child is considered to be healthy, smart, and beautiful. Others want to have a **small** child (17.4 and 14.9 per cent respectively), because then they would not have problems at the time of delivery. Almost all women who say this, immediately continue to tell us that therefore they do not take the red tablets (*kempu gulge*), or tonic tablets (*tonic gulge*), as they are called in the villages. They believe that these tablets make the child big and they would experience difficulties at the time of delivery. As already mentioned in Chapter 5, not only the fear of pain or other physical problems are

Table 7.6. Preference at time of delivery: a big, small, or ... child?

Preference	Mentioned by number and % of women (claiming to eat **less** in last trimester)		Mentioned by number and % of women (claiming to eat **normally** in last trimester)	
A big child	24	27.9%	15	22.4%
A small child	15	17.4%	10	14.9%
Normal child	15	17.4%	6	9.0%
Any child is okay	21	24.4%	23	34.3%
It is up to God	25	29.1%	19	28.4%
	N = 86		N = 67	

related to giving birth to a big child. More important is that if the child is big, women have to go to the hospital and undergo a caesarean which requires a lot of money.

Of these women who claimed they wanted to have a big child, 81.5 per cent said they did not take the iron tablets because that would lead to too big a child. Their statement about their preference for a big child should therefore be interpreted with care. A high percentage of women stated that **any child would be okay**, it does not matter whether it is a small or big child. As T says:

"If the child is healthy, that is more important".

Others are much more occupied with surviving themselves than thinking about what kind of child they want:

I: "What would you like to have: a big child or a small ... ??"

M: "what shall I do? I work in the fields and at home. I do not care about a small or big child".

Others said:

"I do not care for a small or big child; even if the child is small at the time of delivery, I will give it milk and some good care and it will grow after delivery".

This idea is more prevalent in the villages: more women mentioned that if the child was small at the time of delivery they could take extra care after delivery and it would grow and catch up in growth (see Chapter 8).

Women who stated that they wanted to have a small or big child often weakened their statement by adding immediately that ultimately it is up to God.

CASE STUDY

S: "I want a small baby. A big baby will give problems for delivery. Whatever God gives is alright, but a small baby is nicer. If it is a big baby: an operation is needed".

This item, **it is up to God** scored highest of all. When asked what she would like to have, a respondent hits her forehead and reacts:

"How can you ask??? It is up to God: a big child is okay, a small child is okay".

This item was encountered in many sentences in the interviews formulated as

'it's up to God'
'God gives'
'It is God's blessing'
'It is left to God'.

Others had other ideas about the kind of child they wanted:

"I do not care about having a small or big child: I want a boy!!"

or

"I like to have a child with a fair complexion".

7.2.4. Social norm regarding quantity of food intake

Just as with the quality of food intake, we asked women who told them to eat as normal, more or less. And, not unexpectedly given the reasons why women do not eat more, most (98.1 per cent!!) respondents answered it was there own decision not to eat more.

CASE STUDY

"No-one told me to eat more or less; when I am more hungry, I take more food, otherwise I don't take".

However, especially the lower parity women did not know what the effects of the amount of food intake would be on the child. Usually their mother-in-law or mother or older women present in the household answered. Higher parity women, however, knew the effects on the child of eating more or less.

7.2.5. Summary

Most respondents stated they did not eat more during pregnancy. Over half of the women stated they ate less at the end of pregnancy, the others claimed to eat as normal. The main reasons not to eat more are related to feelings of well-being of the pregnant women themselves, not to the child. Women feel they cannot eat more: if they do, they themselves have problems (*namge tras agatai*). If eating more, the following problems occurs: *ekase*, *ayasa*, not being able to work and walk freely. Women stated that because the child is in the stomach and occupies more space, no more food can be consumed. Several women said there was just no digestion to eat more, or acidity prevented them from eating more. The idea mentioned in the literature that women eat less at the end of pregnancy because they want to

have a small child was mentioned by none of the respondents. Actually, the relationship is reversed: because the child is big at the end of pregnancy and occupies more room, women start to eat less. If women eat more, the child will be thin and be less-developed because there is not enough room for it to rotate and grow. Women believe that if they eat less (or better: not more) the child is able to rotate more in the stomach. If the stomach is too full, there is no more room for the child to move. Rotation was not only considered to be good for the child, who would be able to develop more. If the child rotates, the mother feels better too.

The factor that the child would be able to grow more if they ate less, however, is not a reason to eat less. Reasons not to eat more are all related to the health of the mother herself. Enhanced growth possibilities are coincidence rather than deliberately pursued goal. The first reason to eat less at the end of pregnancy is related to the physical well-being of the women themselves.

Regarding quantity of food intake during pregnancy, important others do not play a role at all. Almost all respondents mentioned it was their own decision to eat less.

7.3. Other beliefs about proper behaviour during pregnancy

Besides beliefs regarding nutritional behaviour, related beliefs regarding other proper behaviour during pregnancy are prevalent. Some of these beliefs are described in this section.

The 'shadow of **death**' should not fall on pregnant women. In the case study on page 178 an example is cited of a respondent who was possessed by an evil spirit. Here another example is given:

CASE STUDY
S. tells that during her pregnancy she was afraid at home. An old man living opposite her house had died while she was pregnant in the fifth month. S. says "it was all *driishti*". *Driishti* means "the eye, seeing" (Kittel, 1894), and here it means the evil eye. Actually the evil eye is not related to death itself but to envious relationships between people (see also Chapter 8).
To prevent any ill effect on the child and to feel less worried herself, S. went to a temple in a nearby village. She offered a coconut, betelleaf (*yeele*), some incense sticks, and seven rupees. The priest gave her an amulet (*taita*) which she wore to protect her during pregnancy and she felt fine.

Other respondents also wore a special **amulet** during pregnancy. They had bought them either from religious persons visiting the villages or at the market place.

During pregnancy, women also avoid the touch of **menstruating** women who are believed to be polluting. If a pregnant woman is touched, it influences the health of the child, not the

woman herself. Several women with either very weak or very thin children or with children who died say this was due to the touch of a menstruating woman: *muttu dosha*.

CASE STUDY

C. tells us that pregnant women should not touch women who 'sit outside' (the expression for women who observe segregation during menstruation). During five days, women who menstruate should not touch a child or pregnant woman. C. gave an example. During her last pregnancy, a girl in her family reached maturity, an event which is celebrated by conducting a ceremony. However, she did not attend as she was pregnant.

During **lunar** and **solar eclipses** (*grahana*) pregnant women should keep quiet, without doing anything and just sit silently in the house. If they conduct any activity, the fetus is negatively affected. An example: if they break fuelwood at the time when an eclipse takes place, the legs of the child will be broken. In one of the villages, a child with a harelip was believed to be born with this malformation because its mother did some work during the eclipse. Other body malformations of children can also occur:

CASE STUDY

When we visit P. who was pregnant in the eighth month of pregnancy, she had delivered the previous day. The child was severely malformed: the lower half of the body was not well developed. Although P. first attributes it to the tetanus injections given during pregnancy, creating too much heat (*kaavu*, see also page 155), her *atte* tells later it is because of the *grahana* which took place during her pregnancy. At the moment of a moon eclipse, P. was washing the clothes: wringing the clothes caused this malformation of the lower half of the body.

People know exactly when there is an eclipse: it is written in the *panchanga* and mentioned in the local Kannada calendars (see Chapter 4). When the eclipse is over, a bath is taken and a *puja* conducted.

Given the great preference for sons, various factors are believed to influence the sex of the child (although ultimately it is said to be up to God). A few women say that the date of conception determines sex of the child. If a child is conceived in the new moon period (15 days after *hunnime*, i.e is *amawasya*) it will be a boy. In the full moon period, it will be a girl. Most women mentioned that if the child is on the right-hand side of the stomach, it will be a boy. If it is located on the left, it will be a girl. Of course, during pregnancy most women said that their child was located on the right-hand side.

Photographs of a boy or girl on the walls in the place where the couple sleeps are also believed to influence the sex of the child. One of the respondents went to a special temple dedicated to Veerabadra (an emanation of Shiva) in order to pray for a son.

There were various other examples of behaviour and events during pregnancy to influence the child. One woman told us that her newborn baby's tongue stuck out like a snake, because during her pregnancy she had come across a snake in the fields. Another respondent listened very attentively to a special story of Satjanarayan with the certainty that it would have positive effects on the child. Furthermore, it is considered very important for a woman to be cheerful during pregnancy: joyful and without worries in order to have a healthy baby.

Beliefs regarding food and other proper behaviour which are prevalent during pregnancy are related to beliefs prevalent during the period after delivery. While heating food is believed to be best avoided during pregnancy, in the period after delivery extra amounts should be eaten, as we will see in the next chapter.

Chapter 8 Beliefs about eating and other behaviour in the child's first month of life

Following the beliefs about food and other behaviour prevalent during pregnancy described in Chapter 7 we now look at beliefs in force in the child's first month of life are discussed. Beliefs about what kind of food to avoid or add in this particular period are related to either the health of the mother or that of the child. For example, in the first days after delivery women eat only some special wheat preparations which are considered to be heating and to give energy back to the wet mothers. At the same time, in the first months after delivery water intake is reduced to approximately one third of the normal quantity because it is believed to dilute breastmilk and lead to cramps in the baby's stomach. In Section 8.2 we discuss food habits related to the health of the mother, in Section 8.3 those related to the health of the child.

Like beliefs concerning food intake during pregnancy, beliefs about eating in the period after delivery are related to notions of ethnophysiology. One important such notion is the concept of *hasi may* (Subsection 8.2.2), encompassing the body constitution of the wet mother, which governs not only nutritional behaviour but also other behaviour in this particular period.

First, however, let us describe how deliveries are conducted in this area and the customs and practices in the first days after delivery.

8.1. Delivery and the first days after delivery

In Chapter 5, we already mentioned that among the 186 women in the study population, 175 gave birth to 176 live babies (one set of twins was born): 52.3 per cent girls and 47.7 per cent boys. Eleven women experienced a stillbirth: children born dead after a pregnancy of more than 28 weeks. Of all babies who were born alive, four died almost immediately after birth either as a consequence of complications during delivery (such as the umbilical cord twisted around the neck) or because of congenital malformations. These data imply a high level of perinatal mortality rate in the study population, i.e. 85 per 1,000 live births.

In this section we take a look at the conditions in which deliveries in the research area take place. Most of the information presented was obtained through key-informant interviews of traditional birth attendants.

8.1.1. Deliveries

Most women in the study population (82.8 per cent) gave birth at home, either at their parents' (*tavaru mane*) or their husband's house. A small number of deliveries (N=33) took place in hospital. Six women were referred to hospital due to complications. The other women who delivered in hospital were of lower parity and had a higher level of education.

Most women, however, prefer to deliver at home. Economic reasons play an important role: a hospital delivery is quite expensive. This economic factor came up earlier when we discussed the deliberate avoidance of iron tablets during pregnancy (see Chapter 5). Women avoid these tablets because they believe that they lead to a big child. If the child is big at the time of the delivery, a caesarean would be needed. One of the traditional birth attendants explained and illustrated this as follows:

Y[5]: (pointing at a brass waterpot) "do see this waterpot?
I: yes
Y: the belly of it is big, you see, and the neck is small. Suppose a big baby is there in the belly: how is it supposed to come out through this narrow neck? That is not possible: the doctor has to open the belly to fetch the child."

Moreover, besides this economic consideration, mothers of the respondents told us they prefer their daughters to deliver at home because only there appropriate care for both mother and child can be provided (see Subsection 8.2.2).

Most of the deliveries which took place at home were conducted by a traditional birth attendant (65.0 per cent), the dai (*sulgitti*). A relatively high proportion were conducted by a family member, often the mother (30.3 per cent). Only a small number of the respondents got help from a village health worker (14.7 per cent). Here, again, economic reasons play a role again. One of the key-informants, an older Madiga woman who conducted many deliveries in her family, remarked that poor women prefer a dai rather than modern health workers. She related this to the attitude of government nurses and doctors to give injections in order to induce labour: injections which are quite expensive. The data on birth attendance indicate that at least 30 per cent of all deliveries are attended by an untrained person.

In most villages, traditional birth attendants are present. Except for one young woman who lives in Devarhubli, most of them are elderly women. They belong to different caste groups. Four of them are Muslim while the others belong to Kurbar, Maratha, Gouli, and Lingayat (see Chapter 4).

Except for the very old women, all of them had received at least one training course provided by either the local hospitals in nearby towns or the development agency IDS. Most of them became a dai only after participation in such a training programme, as the case study on the next page illustrates. Another birth attendant living in Holtikoti (she is Maratha) learned how to attend deliveries from the former dai (who was Muslim) and only later on received an additional course in a hospital. The birth attendant in the Gouli hamlet did not receive any training and acquired her skills from her mother-in-law who had worked as a dai for many years. When she grew old, the present dai took over. Most of the traditional birth attendants claimed they helped in the normal deliveries and referred women with complications to the hospital.

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[5] See footnote 4, page 155.

CASE STUDY

P. is a dai in the village of Mandihal. In the six years in which she has worked as a traditional birth attendant, she has conducted about sixty to seventy deliveries. In the village, she is called the government dai. Six years ago she was selected by the local nurse to participate in a government supported training scheme for birth attendants. She had never conducted deliveries before. She went to the hospital in Alnavar, a small town nearby, and followed a course of four days and then started the job. Only during the first three months, she says, did she receive a remuneration from the government. Since then, she only receives a remuneration per delivery provided by the family of the delivered woman.

Deliveries take place on the ground: most women just squat on some bags or clothes, sometimes on a wooden plank (*mane*). Most women give birth in the sitting position, with a basket (*butti*) in front for support. However, the younger birth attendant who was trained more recently told us she likes women to lie down. Squatting drains too much energy from the woman, she believes, and she herself is more able to give appropriate help if the woman is lying down. The Gouli dai told us that in her community, a woman is supported by two other women at the time of delivery: one behind and another in front of her.

Some special food items are known to speed up the process of birth. Cummin (*jiirge*) boiled with water and sugar is commonly taken in all villages, while women in the forest area drink a concoction made of a fruit grown in the forest called *gadjiga*. Also ghee (clarified butter) is believed to quicken delivery due to its heating (*kaavu*) qualities. Hot tea is commonly drunk during the process of delivery. Some women add butter as it is supposed to make 'the birth canal more slippery, so the child will come out more easily'.

In Chapter 7, we saw that during pregnancy women should avoid too much heat either evoked by food, work, season, allopathic medicines or sexual intercourse. Too much heat would induce a spontaneous abortion. At the time of delivery, however more heat is provided as it accelerates the process. Heating food like ghee or hot tea but also other items are applied. One of the dais told us she advises women to take a warm bath: the heat quickens the process of delivery.

Several other practices are known to make delivery easier and faster. Some birth attendants give massage with coconut oil or warm water and rub the belly in order to push the child downwards. Others use a rope (*patti*) which is put around the belly of the delivering woman, just under her breasts. The rope is believed to prevent the child from moving up at the moments the woman has contractions and to push the child downwards.

Most dais received a training and learned to cut the umbilical cord (*hokkala*) with a clean razor. In reality however few of them bring new razors at the time of delivery. Only the younger, recently trained birth attendant told us that she brings a clean razor each time. The family of the delivering woman pays a few rupees for it. All other attendants told us they did not have the money to provide a new and clean razor each time. If no razor is brought along,

anything suitable or available in the household is used, often the sickle (*kudugolu*) meant for cutting paddy is used. Before delivery the instrument is sharpened and only after cutting the cord —not before— is it cleaned and washed with warm water. Indeed, infections of the umbilical cord were observed among children in the study population.

Very commonly, the cord is tied with some sewing thread. Most birth attendants said they did not apply anything to the cord. But the attendant in Mugad said she put dettol on it and the dai in the Gouli village told us that some dried pieces of cow dung are burnt and the powder is put on the cord.

The part of the umbilical cord which falls off a few days later can be used for an amulet (*taita*). It is dried and later put into either a leather, silver or copper amulet, which is tied around the child's waist to protect it against the negative effects of the touch of a menstruating woman, i.e. *muttu dosha* (see also Chapter 7). Others said it would protect against the evil eye and evil spirits. If not used for a amulet, this part of the umbilical cord is immersed into the water of a river or tank.

At the time of delivery, if the placenta (*masa*) is not expelled soon enough after the child is born, the belly is massaged again. In general, the birth attendants told us they take half an hour as a criterium. Another way to get the placenta out is to drink cold water or to put the hair plait into the mouth in order to induce vomiting and contractions.

The placenta is put into a pot (*gadige*). Five different types of grains and five paisa are added. One respondent told us they took green gram (*hesaru beele*), garlic (*belloolie*), arecanut (*adike*), thurdal (*toogaare beele*) and *alsande* (kind of pulse). But in general any five grains can be added. Subsequently, a *puja* is conducted and the pot is buried deep in the ground so no animal can touch and disturb it. If an animal touches it, the physical or mental health of the child will be adversely affected. This custom of burying the placenta at the back of the house is practised by all communities. The Muslim dais in Mavinkoppa made a further distinction which symbolizes the status of women in society. While the placenta of a girl is buried outside the house, as she leaves the house at the time of marriage, the placenta of a boy is buried inside. This custom was only mentioned in this village and not known among the other Muslims in the study population.

After delivery, mother and child are bathed with warm water. From the first moment onwards, the child stays with its mother on the *horsu* or sleeps in a small hammock (*joolige*) attached to the bed. (Later it sleeps in a cradle). The Gouli women put the new born child in a basket full of grass for a few days.

The *horsu* is a bed made of wood and woven thread and is fabricated by the carpenter in the village on an auspicious day indicated by the *panchanga* (see Chapter 4). At the time of the delivery, the bed is placed in a separate room or in a corner which is secluded from the rest of the house by curtains made of bags or blankets. These prevent wind, cold and dirt and also bad influences of people and evil spirits from reaching mother and child. Under the bed, a charcoal fire (*benki*) is placed. Mother and child stay in this dark and above all warm place for some time.

8.1.2. The first days after delivery

Birth is considered to be polluting (*mailige*) by all caste groups, also by the Harijans and Muslims. The period of pollution lasts for five days. The more traditional birth attendants visit the mother twice a day during these days and give her massage with oil, turmeric (*aarsna*), neem (*beevu*) and garlic. Both mother and child are given a hot bath. Each time, before returning home the dai takes a bath in the house of the wet mother (except in the case of the Harijans: then she takes a bath at home) in order to remove the pollution. Not all birth attendants provide these services during these first five days. If they do not, the woman's mother or another female member of the family provides the same care.

On the fifth day (*aidesi*), the end of the pollution period is celebrated with a ceremony. The house is cleaned with cow dung, clothes are washed, the bed is cleaned and a *puja* is conducted. The dai is endowed with some paddy, sweets, arecanut, plus betelleaf and some money. Sometimes also a blousepiece, a *saree,* or bangles are presented. The amount of the remuneration of the dai depends on the socio-economic status of the household, although the sex of the child may also play a role in the kind of remuneration: if a boy it might be higher.

On this fifth day special food is prepared: *kobri kara*. The ingredients differ from one household to another, but commonly consist of dried coconut and sugar or jaggery. Dried dates, gum (*antu*), ghee, cashew nuts, and spices like cloves or cardamom can be added.

Some caste groups, especially the lower ones like Bhovi, Madar, Madiga and Gouli celebrate the naming ceremony on the same day. Maratha and Lingayat name the child on the 12th day (for a boy) or the 13th day (for a girl). Muslim children are named on the first day (given by the *mullah*) while on the 40th day a special ceremony is conducted. If a child is very thin and weak at the time of delivery, the naming often is postponed. Names for Hindu children are selected on the basis of astrology (represented in the *panchanga*), as the following case study illustrates.

CASE STUDY

The child of one of the research assistants was born in January 1992, under the sign of *Kanya* (Virgo). According to the *panchanga* the name of children born under this sign should start with the Kannada letters 'pu', 'po', or 'pa'. This girl was named Pooja.

The name selected on basis of astrology is called the *Nakshatra* name. When the child marries it plays an important role: the *nakshatra* names of the future couple are compared to see whether they suit each other (see Chapter 4). The naming ceremony is predominantly a women's affair. One of the ceremonies which we attended took place in a Maratha Shivaji family. The ceremony illustrates how much marriage is a relationship between two families rather than between two individuals.

CASE STUDY

The naming ceremony took place on an auspicious day and time as determined by the *panchanga*. Many women attended the ceremony which took place in the house of the parents of the wet mother. The cradle (*tottla*) of the child was beautifully decorated with flowers and the wet mother sat in her green *saree* on the ground next to it. During the ceremony, female members of the husband's family stood on one side of the cradle while those of the wet mother stood on the other side. The child (dressed in clothes presented by the husband's sister) was passed from one side to the other (thus from one family to the other) five times, alternately under and over the cradle. Five times, possible names (some of them of Gods and Goddesses) were whispered by the husband's sister into the child's ear. The fifth time, she whispered the actual name and while doing so she was teasingly hit on her back by family members of the wet mother. A *puja* was conducted, *aarti* waved for the wet mother and presents given to the child.

Another event reported to occur on the fifth day is the appearance of the Goddess Shetigaava. (The fifth day is also called *Shetigaava vaara* — the day of Shetigaava). In the night, the corridor in the house is kept free for her arrival. It is believed that the Goddess comes and writes the fate of the child on its forehead.

All these customs are generally practised by all caste groups, with some variation. Muslim women, for example, celebrate aidesi but also observe customs not known among Hindus. During the first days after delivery Muslims put five things under the *horsu*: garlic, cashew, dried dates, cloves and arecanut together with a needle and black thread. In addition, on the 40th day after delivery, they conduct a ceremony in which the old things are removed and replaced by new things. Old bangles and clothes make place for new ones.

During the ceremony on *aidesi*, a dried piece of root (*bhajji beeru*) is tied around the wrists of both mother and child. Its purpose is explained in different ways. Some women said it will keep the body of both mother and child warm. Others said it is just a symbol of the wet mother and yet others told us it protects both mother and child against evil spirits during this period of *hasi may*. Here, we come to an important ethnophysiological concept referred to in the first period after delivery; *hasi may*, which determines nutritional behaviour of women after delivery, is discussed in the next section.

8.2. Beliefs with regard to the mother

We mentioned before that beliefs about food intake in the child's first months of life are related to either the health of the mother or that of the child. In this section, we focus on the first relationship. First, we list food which is avoided or added to the diet in the child's first month of life. In addition, we discuss the underlying notion of ethnophysiology, i.e. the concept of *hasi may*.

8.2.1. Beliefs about food intake

During the first five days after delivery, women eat only sweets made of wheat with milk and sugar or jaggery (*payasa*, *sajjaka*, *alavi*, or *rava ganji*). Wheat, sugar, and jaggery are considered to be heating, and heating food (like other items with heating qualities as we will see in the next paragraph) is considered to be essential in this period after delivery.

At *aidesi* (the fifth day), *kobri kara* is added to the diet (see previous section). A special sweet, *ladu*, to be bought at the city market is eaten. It is very rich, made from heating foods like wheat, dried fruit, dried coconut, nuts, and gum. However, in the study population only a few women, in the higher socio-economic class, could afford to buy it.

Some time after delivery, rice and *rotti* are eaten again. The period in which rice and *rotti* are avoided varies widely between respondents. Some women started to eat it again after five days, others after two weeks. However, in the period after delivery *rotti* and rice are only eaten immediately after preparation while they are still hot and fresh. *Rotti* and rice which is kept after preparation is considered to be cold and hard and should be avoided as it causes stomach problems for both mother and child. Due to this belief, lactating women often do not consume the food supplementation provided by the *anganwadi*. Women receive the *uppittu* some hours after preparation when it is no longer fresh and hot (see also Chapter 4). In addition to hot rice and hot *rotti*, in the period after delivery other heating foods like eggs, mutton, and ghee are consumed more often.

While heating food is considered to be essential, cold food should be avoided in the period after delivery. Women drink warm water only and avoid cold water. Also cold food like curds (*mosaru*) and buttermilk (*majjige*) are avoided.

Other foods which are avoided are fresh green chillis, pumpkin, brinjal, and sweet potato. Some women also avoid lady fingers, arecanut, and *ginna* (colostrum of the cow). These are said to be *barsna* (see Chapter 7) for both mother and child: they lead to an adverse reaction of the body. Fresh chillies, for example, cause stomach pain for the mother and, via breastmilk, dysentery for the child. The other foods are believed to cause swellings (*baavu*) in the body of the mother, especially in her legs, hands and face. A few others avoided them because they are supposed to lead to jaundice (*kamani*).

Some women classified brinjal together with cold *rotti* and fresh coconut and banana as hard food: hard to digest. Only soft food should be consumed in this period after delivery. This classification of food by hard and soft is related to the medical system Ayurveda, described in Chapter 4.

If we look at the quantity of food intake in this period (see Table 8.1), the data indicate that average energy intake in the first two months amounts to 1,658 kcal. a level slightly higher that the average in the last month of pregnancy which was 1,621 kcal. In the following months after delivery, energy intake slowly increases to return to a normal level.

The beliefs about food to be avoided and added in this period after delivery are related to notions of ethnophysiology, described in the next subsection.

Table 8.1. Average daily energy intake (kcal.) in the last month of pregnancy and first months after delivery

Month of pregnancy >	9		
Month after delivery >		1-2	3-5
Average energy intake	1,621 kcal	1,658 kcal	1,710 kcal
N	50	42	20

8.2.2. The concept of ***hasi may***

After delivery, women are said to be in *hasi may*, literally a fresh, raw or tender body. The concept is not only used for women who have delivered but also for girls who have reached maturity. In these two states there are many similarities in the kind of food to be eaten and care to be taken.

During *hasi may*, the body of the woman is vulnerable and easily affected not only by cold or wind but also by the evil eye (*kannu* or *driishti*) or evil spirits and ghosts (*bhuta*, *devva* or *gaali*). One of the respondents said that when she was in *hasi may* and went outside for a while, she was bothered by *devva*: a spirit of the ancestor. As a result, she became very weak. Although she went to the temple where a *mantra* was recited by the priest, her health did not improve for many months.

The body of a wet mother is supposed to be weak and vulnerable but above all cold. As T. says:

> "all the heat has gone during delivery. I lost a lot of blood so there is no *kaavu* (heat) any more in the body. There is some tiredness."

and

> "cold is there now... everything heated is needed".

Warmth and heat are essential in this period after delivery. In the last former section we saw that women consume more heating foods like wheat preparations, hot rice, and *rotti* and warm water. In addition, heat is created by seclusion in a special room or corner of the house separated from the rest of the house by curtains. Also the charcoal fire (*benki*) kept under the bed is heating. *Benki* is given twice a day in the first period after delivery and ideally lasts for three months. Moreover, heat is provided by hot water baths and massage with oil and turmeric (*aarsna*), neem and garlic. And warmth is preserved by the cap or scarf which women wear on their heads.

The respondents believe that during *hasi may* heat gives back the strength and energy which is lost during delivery. Heat is believed to freshen the blood and to create new blood. Moreover, warmth relieves the pain suffered at the time of delivery. Warmth, too, is believed

to be good for the 'open stomach' and to tighten the stomach again. For this, women also 'bind the stomach' (*hotte kattu*): a cotton cloth is tied around the (under)belly

"to get the stomach down and to close the open stomach again".

Women explained that due to pregnancy their belly had expanded and by binding the stomach it would return to its normal shape. In addition,

"the birth canal is open after delivery and should be closed again".

The cotton cloth worn after delivery speeds up this process. Stomach binding is also believed to be good to get rid of the waste blood. The period women 'bind the stomach' varies: some wore the cotton cloth for five days only, others for two months.

Ideally, the period of *hasi may* after delivery lasts for three months and is concluded with a special *puja*. As the mother of one of the wet mothers said:

"after taking care of these things for three months, a woman will be strong enough to go to the fields again".

In reality, the length of the period of seclusion and rest depends on several factors. First gravida women are commonly given time to recover and only return to their husband's place after five months (see also Chapter 5). Economic circumstances often determine whether a woman can afford to stay idle for a period of three months. One of the very poor women in the sample was working in the kitchen, preparing food for her children, as soon as two days after delivery. Gouli women also resume work soon after delivery. The dai in the Gouli hamlet told us that most women resume work five days after delivery.

The length of *hasi may* also depends on season. In the summer, when there is more heat from the sun, the period of seclusion can be shorter. This idea was very nicely illustrated by one of the traditional birth attendants whom we told that women in Holland may leave the house a few days after delivery.

Dai: "how is that possible? ten days only? Then it must be much more warmer there?
I: no, it is much more cold over there.
D: then how can ten days be enough? poor women!! (*paapa*)".

Women who had a miscarriage or stillbirth are also considered to be in *hasi may* and receive the same care, although often for a shorter period. The concept of *hasi may* seems a nice way to protect the health of both mother and child after delivery. As one of the respondents told us:

"this kind of protection against cold, dirt and evil spirits (*devva*) is not present in the hospital and therefore we prefer women to deliver at home".

Also, it is a perfect time for women to get some rest and refrain from work, especially if they stay at their parents' house. But there are also some disadvantages, as the case study of G. illustrates.

CASE STUDY
After eight months of pregnancy, G. gave birth to a very small child. Soon after delivery, G. started to feel unwell: she turned yellow. She wanted to go to the hospital but her mother and other relatives believed she should not go because she was in *hasi may*. She was too vulnerable for all kinds of influences. She turned out to have jaundice and when her relatives finally agreed to bring her to the hospital it was too late: she died.

In another case, a mother who gave birth to a very small and thin child was not allowed to leave the house and bring the child to the hospital because she was in *hasi may*.

8.3. Beliefs with regard to the child

Beliefs about what to eat after delivery are either related to the health of the mother or to that of the child. The first type of food habits were discussed in the former section, here we focus on the child.

8.3.1. Beliefs about food intake

During the first three days of life, the child does not receive breastmilk. Asked why they did not give breastmilk, the respondents often said:

"there just is no milk".

The 'yellow milk', the colostrum, is not considered to be good milk and it is simply thrown away. Some women reasoned that this milk had been in the breasts for nine months and was spoiled. Others said colostrum is dirty and only clean milk should be given to the child.

During these first three days, the child is given sugar water and honey (*jenu tuppa*) on the lips. The Goulis give buffalo milk to the child during these first days. It is common practice to start breastfeeding after three days and women continue to breastfeed for years. Several foodstuffs are believed to influence the production of breastmilk. Galactogogues, i.e. food items which are believed to stimulate the production of breastmilk, are seeds of fenugreek (*menthe*) boiled in warm water with sugar, garlic and green vegetables. In addition, during *hasi may* water intake is restricted as too much water is believed to dilute breastmilk and to lead to cramps in the stomach of the child. Women indicated they drank about one third of the normal amount after delivery.

Fresh chillis lead, via the breastmilk, to dysentery for the child. The same effects are created by cold and hard food like cold *rotti*. Warmth, in addition to all its beneficial effects for the mother (see Subsection 8.1.2) is also believed to increase breastmilk.

Another custom worth mentioning is that it is considered quite normal for a woman to breastfeed a child other than her own.

CASE STUDY

Once we visited S., who lost her own child in the process of labour. Her co-sister, who had a small child, was working in the fields that day. S. who was resting after delivery, had stayed at home and gave breastmilk to the child.

Asked during pregnancy what they wanted to have —a small or big child— and what they could do to affect this, many women said that even if the child was small at the time of the delivery it would grow afterwards and catch up in growth (see Chapter 7). Besides breastmilk, other foods are given to make the child grow. Dried dates are mixed with some breastmilk and given to the child. Many women also gave *gutti batli* during the first months of life. Traditionally, *gutti batli* is a bottle (*batli*) with Ayurvedic medicine and drops of this medicine are mixed with breastmilk. Nowadays, however, several different bottles are sold as *gutti batli*: multivitamin drops for example. In addition, Gripe water is believed to be good for growth of the child.

Like the mother, a child is protected from too much wind and cold. The custom of avoidance of banana and fresh coconut observed during pregnancy is continued after delivery. Along with other *tampu* food such as buttermilk and curds, these food items are avoided (especially in the cold season) because they lead to too much *kapha*, inducing illnesses like colds, coughs, and pneumonia (see also Chapter 7).

8.3.2. Beliefs about other behaviour

Like their mothers, during the first months of life children are considered to be very vulnerable. All kind of influences, like wind and cold, the evil eye and evil spirits can affect health of the child in a negative way. The same ideas concerning heat and warmth needed for the wet mother in the period after delivery are applied to the child. In addition, children are protected from too much cold by wearing the very typical caps on their head.

Small children, too, are believed to be very vulnerable for influences from people or evil spirits. For example: it is not allowed to take a photograph of a small child because it may lead to *kannu* or *driishti*. *Kannu* literally means eye and here it is referred to as evil eye. In the case of the photograph, someone who sees the picture and who has bad intentions can do a lot of harm to the child. As a research assistant explained:

> "all people who see the photo will say 'it's a beautiful child, it is beautiful' and in that way the child will be badly affected".

Another assistant explained *kannu* in the following way:

> T: "if someone says "oh, your baby is good and healthy, your baby is very good" , then that is *kannu*, bad influence".

The concept includes envy: other people feel jealous because the child is very beautiful. The child can be protected against evil eye by black kohl spots (*kadige*) on the face, especially on the cheeks, or by putting a black thread around the wrists (*nederu*). Children who are affected by *kannu* become weak or thin or cry a lot. If a child is affected, the evil eye can be taken away by a special ritual. A powder is made from salt and fresh red chillis. This mixture is

held in the hand and after moving it three times from head to legs of the child, it is thrown into the fire. Some ash (*vibuuti*) is put on the forehead of the child and the evil eye is supposed to have been removed.

Also evil spirits can affect health of the children. One of the children in the study population died one and a half months after delivery without showing any sign of illness. People concluded it must have been inflicted by *gaali*.

Another factor influencing the health of the child, is *mutt dosha*. As mentioned in Chapter 7, children who are very weak at the time of delivery, are said to be affected by *muttu dosha* —the touch of a menstruating woman— during pregnancy. During childhood also, health of infants is threatened by the touch of menstruating women (and barren women as well). Children are protected against it by a copper ring in one ear which is placed by a traditional medical practitioner. The amulet (*taita*) with the dried piece of the umbilical cord, tied around the waist of the child (see Subsection 8.1.1) also protects the child against *muttu dosha*.

We conclude this section with one more example of a totally different perception of the etiology of certain illnesses. In the biomedical view, birth weight is believed to be one of the important indicators of survival chances of the child. However, women in the study population use a totally different indicator, as the following case study illustrates.

CASE STUDY

A Madiga woman told us that she had already lost two children. She commented that it was no surprise that one boy died, for at the time of delivery she saw his *sulli* and knew he would not live a long life. A *sulli* is formed by hair on the back, between the shoulder blades, where short and soft hair grows. Among small children, this spot is easily discerned. The shape of the *sulli* should be beautifully round and if not, it is believed that the child will not live long. The respondent asked a neighbour to show us the beautiful *sulli* of her daughter: indeed we saw a very round spot on the back in which a tattoo —*hanchi battu*— was made.

8.4. Summary

Over 80 per cent of our study population delivered at home, either at their parents' (*tavaru mane*) or their husband's house. Of these home deliveries, 65.0 per cent were conducted by a traditional birth attendant, the dai (*sulgitti*). A relatively high proportion of deliveries (30.3 per cent) was conducted by a family member, often the mother. Only a small number of the respondents received help from a village health worker (14.7 per cent).

In the period after delivery, women are in *hasi may*, which literally means tender body. Women with their new born babies are secluded from others in the house. They stay in a dark but above all warm place. Heat is considered to be essential in this period after delivery: it

will give back strength to the mother. Heat is provided by the blankets surrounding the bed: they not only keep away cold but also wind and bad influences from either people or evil spirits. Moreover, heat is provided by the charcoal fire under the bed, by hot water baths and massages, by wearing a scarf and by eating heating food like wheat preparations, hot *rotti* and rice and warm water.

Ideally, the period of *hasi may* lasts for three months but in reality the period varies. Economic or family circumstances might shorten the period. Besides the beneficial aspects of the seclusion of women after delivery (they get rest and can refrain from work), disadvantages were also identified. If either the mother or child becomes ill, they are not allowed to leave the house and visit a hospital.

In the period of pregnancy (Chapter 7), beliefs are predominantly focused on what kind of food should be avoided. Papaya should be avoided as it is supposed to induce an abortion. Banana and fresh coconut because they lead to illnesses for the child after delivery. Very few beliefs about food to be eaten extra were identified. In the period after delivery, however, beliefs also include food which should be added to the diet. This illustrates that, in general, much more extra care is given to the mother after delivery than during pregnancy itself.

Chapter 9 Conclusion and discussion

In this concluding chapter, we answer the research questions as they were formulated in Chapter 1.

Reduction of energy intake during pregnancy?
In the feasibility study, conducted before the actual research started (see Chapter 3), women in the research area reported that they ate less at the end of pregnancy. However, even though they say they reduce their food intake, the question is whether they really do so. In the actual research project, therefore, first of all we studied whether the reported reduction in food intake during the last trimester of pregnancy could be confirmed with quantitative data on food intake. Moreover, we studied the extent of reduction of food intake and related background variables.

Data on food intake were gathered by survey. They indicate that the diet of women in the study population is deficient in several kind of nutrients. Most respondents do not even reach the recommended levels of energy, protein, iron, and calcium intake for non-pregnant women. Besides poor economic circumstances, another constraint on the food intake of women is the distribution of food within the family. Only after men and children have finished their meals, are women allowed to eat what is left over. In addition, most women (especially the younger ones) are dependent from others to bring food from the market place.

Based on a small group of respondents (for whom all observations were available; N=41), we found a trend of declining energy intake within subjects over the whole period of pregnancy. In month three/four of pregnancy, the average daily energy intake amounts to 1,774 kcal. (± 312). The biggest change takes place between month five/six/seven (T1) and month eight/nine (T2) of pregnancy. In this period, daily energy intake declines from 1,749 kcal. (± 279) to 1,662 kcal. (± 248).

In general, the limited number of observations (not only regarding food intake but also regarding the other variables) was one of the difficulties faced in the quantitative part of the research. Especially the custom for women to deliver in their parents' place, and thus leave their husband's place, interfered with our research. We knew from the literature that first gravida women leave their husband's house, and we expected to be able to follow this small group. In reality however, higher parity women (up to parity five) left for their parents' place. This meant that in addition to the eleven research villages, some eighty to ninety other villages within a distance of 30 kilometres from Dharwad town had to be visited (see also Chapter 3).

The change in energy intake from T1 to T2 appeared to be related to neither economic nor ecological factors. Energy intake during pregnancy is reduced whatever the month or season. Women situated in the lower socio-economic class even appeared to increase energy intake from T1 to T2, while women in the higher classes reduced it.

The main determinants of the change in energy intake between T1 and T2 of pregnancy turned out to be prepregnancy weight-for-height status and length of last birth interval. With respect to the first variable: women who are better nourished are more likely to reduce daily energy intake than women who are underfed before pregnancy. Differentiating for two groups of Chronic Energy Deficiency (CED), measured by the Body Mass Index (BMI = weight(kg.)/ height^2 (centimetre * 100), women in the undernourished group (BMI $\leq$ 18.4) hardly change daily energy intake and remain at a level of around 1,660 kcal. The well-nourished women (BMI $\geq$ 18.5), however, show a decline in daily energy intake from a level of more than 1,800 kcal. at T1 to 1,630 kcal. at T2: an average reduction of 170 kcal. The average daily energy intake in the last two months of pregnancy thus hardly differs between the two groups of CED.

Effects of a reduction of energy intake

The second research question (see Chapter 1), focused on the effects of a reduction of food intake during the last trimester of pregnancy, among women whose nutritional status is already poor before conception, on the health condition of women and pregnancy outcome.

An extensive literature study (Chapter 2) indicated that, in general, such a reduction in energy intake will affect the nutritional status of women, while the birth weight of children is not affected. In the case of a deficient energy intake, maternal fat reserves (which are stored between the 10th and 30th week of pregnancy) are mobilized and the foetus grows at the expense of the mother. However, recent studies conducted in Indonesia (Kusin *et al.*, 1992; Sri Kardjati *et al.*, 1994) and Pakistan (Winkvist *et al.*, 1992) suggest that there is a limit to maternal depletion too. These studies indicate that women with a poor nutritional status before conception, at a minimum level of energy intake during pregnancy of about 1,500-1,600 kcal., gain more weight over pregnancy. Women with a lower prepregnancy weight-for-height status gained more weight during pregnancy (compared with women with a high prepregnancy weight-for-height status), at the expense of their children. These children showed lower birth weights than children born to mothers with a higher prepregnancy weight-for-height status. Based on these studies we formulated the hypothesis (see Chapter 3) that a reduction of energy intake during the last trimester of pregnancy, among women with a poor prepregnant nutritional status, will not affect health condition of the mothers, but will negatively affect birth weight of children.

Health condition of women

Among women in the study population, average weight gain over the whole period of pregnancy is 6.4 kg. ($\pm$ 3.2). The data in this study indicate that prepregnancy weight-for-height status is the main determinant of weight gain. Women with a lower BMI before pregnancy are likely to gain more weight during pregnancy than women with a higher BMI. Differentiating for two different CED groups, under-nourished women (BMI $\leq$ 18.4) gain on average 7.2 kg ($\pm$ 2.9) while well-nourished women (BMI $\geq$ 18.5) gain on average 5.2 kg ($\pm$ 3.3).

This finding is similar to the results reported in Indonesia and Pakistan. Kusin *et al.* (1993) conclude that

> "in CED women, pregnancy .... promoted weight gain ...."

and

"apparently there are limits to maternal depletion" (Kusin *et al.*, 1992, p. 15).

In our study, it was possible that well-nourished women gain less weight because they are more likely to reduce energy intake at the end of pregnancy. However, no relationship was found between change in energy intake and total weight gain during pregnancy. Examining the differences in weight gain for two groups of CED and change in energy intake, under-nourished women who reduce energy intake appear to gain most weight. Apparently, not the change in energy intake but health status before pregnancy influences weight gain during pregnancy.

However, higher weight gain might be due to excess fluids and not to an increase in fat. Maybe under-nourished women are more likely to develop oedema during pregnancy? Apart from a few respondents who we know developed oedema (see Chapter 5), we were not able to gather information on overall prevalence of oedema.

If we analyze the relationship between change in energy intake from T1 to T2 and weight gain in the same period, no linear relationship is found. However, women who reduced energy intake by more than 300 kcal. show a significantly lower weight gain in these last two months of pregnancy.

In this study, weight gain is one the indicators of health condition of women during pregnancy. Development of skinfolds and mid-upper-arm circumference over pregnancy were also estimated. For both variables, no relationship with change in energy intake was found. Methodological problems might play a role. We were able to study development of skinfolds of biceps, triceps and subscapular only and had to cancel measurement of the skinfolds of supra-iliac and thigh (see Chapter 3). Skinfold of supra-iliac is known to be one of the skinfolds (together with subscapular) showing the most significant changes during pregnancy. Distortions therefore might be due to the fact that this skinfold is left out. Moreover, skinfolds are known to be difficult to estimate: measurements might differ between observers and points of measurement. In addition, like weight gain the development of skinfold may indicate either a change in fat or in fluid contents.

Summarizing, the hypothesis formulated in Chapter 3, i.e. in general a reduction of energy intake during the last trimester of pregnancy will have a negative effect on health condition of the mothers, is partly confirmed. Although the data show no relationship between change in energy intake and total weight gain during pregnancy, they do suggest that women who reduce energy intake by more than 300 kcal. from T1 to T2 gain significantly less weight in these last two months of pregnancy. The second hypothesis, i.e. a reduction in energy intake during the last trimester of pregnancy among women with a poor nutritional status before conception does not affect the health condition of women, could be confirmed for total maternal weight gain during pregnancy.

Pregnancy outcome

The average birth weight for all live births was 2,646 grammes ($\pm$ 464). 26.1 per cent of the children were of Low Birth Weight. Premature children and primiparae, show a significantly

lower birth weight. Of all variables taken into account, total weight gain during pregnancy turns out to be the best predictor of birth weight.

In this study no relationship was found between either prepregnancy weight-for-height status or change in energy intake and birth weight of the child. The data suggest that children born to women who are under-nourished before pregnancy show an average birth weight which is not significantly different from the birth weight of children born to women who were well-nourished before pregnancy starts.

This finding is not in accordance with other studies, which report a positive relationship between prepregnancy weight-for-height status and birth weight. The differences in results might be due to the limited number of observations. The second part of the hypothesis, i.e. birth weight among these women will be negatively affected, could therefore not be confirmed in this study.

Growth and development of the child in the first month of life

Based on the literature, in Chapter 1 we postulated that birth weight of children is not a sufficient indicator of well-being for newborns. We decided to study growth and development of the children in the first month as well. In Chapter 3, we formulated the hypothesis that, like children in other developing countries, Indian children show a higher growth velocity (compared with children in industrialized countries).

In this study, data indicate that growth velocity (grammes weight gain per kg body weight per day) of children in the first month of life amounts to 10.3. This figure is higher than growth velocity reported for children in industrialized countries and resembles that for children in Tanzania and Nigeria. The hypothesis formulated thus was confirmed.

Reasons behind the custom of reduction of food intake

Our study also focused on the reasons behind the custom of reduction in food intake in the last trimester of pregnancy, as perceived by women themselves. In Chapter 2, we mentioned that, based on the literature only, we expected the reasons behind the custom of reduction of food intake to be predominantly culturally and socially determined. Physiological factors were expected to play a minor role. However, during the implementation phase of the research project it became more and more clear that physiological factors might play a role as well (see later).

With respect to the cultural factor determining food intake during pregnancy, we expected the custom of reduction of food intake during the last trimester of pregnancy to be determined by beliefs about what to eat related to notions of ethnophysiology. In addition, these beliefs were expected to be related to beliefs regarding other proper behaviour during pregnancy, and to be generated from a body of knowledge of which the medical system Ayurveda is most important.

Regarding the social factor, we expected women to be influenced in their beliefs about quantity of food intake during pregnancy:

- by female members of the family-in-law, especially the mother-in-law, and
- to a lesser extent by female neighbours, and
- by the own mother and female members of the own family as well.

Asked how much they ate during pregnancy compared with their normal food intake, most women (54.4 per cent) mentioned that they ate the normal amount during the first months of pregnancy and less than normal in the last trimester. Over 30.0 per cent claimed that they ate normally during the whole pregnancy. Another 12.0 per cent stated they ate less during the first months and afterwards just normally. Only seven women claimed to have eaten more during pregnancy.

The women who claimed to eat less indicated how their food intake changed. Some reported a slow decline in intake over the whole pregnancy, while others mentioned a reduction after month six. Others only ate less during the last month. Also, women indicated which changes took place: they either ate less *rotti* or took two meals instead of the usual three.

It is evident that most of the women claim not to eat more than normal. The main reasons not to eat more are related to health of the pregnant women themselves, not to the child. Women feel they cannot eat more: if they do so, they themselves will have problems (*namge tras agati*).

The following problems would occur: *ekase* (breathlessness, not able to work, acidity), *ayasa* (feeling bored, tired) and not being able to work and walk freely. Several women said there just was no digestion (*khapsu*) to eat more or that acidity prevented them from eating more. Other women stated that because the child is there and occupies space in the stomach, no more food could be consumed.

The reason mentioned in the literature, i.e. the preference for a small child, was not reported by the respondents in this study. None of the women mentioned this as the reason for not eating more during pregnancy. Actually, the perceived relationship was reversed: **because** the child is big at the end of pregnancy and occupies more room, women start to eat less. If they eat more, there would be less room left in the stomach for the child, and it would be thin and less developed. On the other hand, if women eat less, there is more room in the stomach for the child and the child is able to move and to develop better. Movement of the child is not only considered to be beneficial for the child, the women themselves also feel better if the child moves. The belief that women eat less because the child occupies more space in the stomach is related to the prevalent idea that one eats until the stomach is full.

However, this perceived consequence, i.e. the child is able to grow better, is not a reason to eat less. The main reason for eating less is related to the health of the women themselves. The beneficial consequences for the child are a coincidence rather than a deliberately pursued goal.

Nichter and Nichter (1985) mentioned that the commonly given explanation, for the custom of reduction of food intake during the last trimester of pregnancy, i.e. women want to give birth to a small child in order to have an easy delivery,

"tend to underestimate pregnant women's concern for the health of their babies" (see Chapter 1).

These authors concluded, based on their research in South India, that women reduced their food intake because they wanted to have a big child. However, this is not in accordance with our study: women do not eat less **because** they want to have a big child. They eat less because they want to feel well themselves. Therefore, we would like to add that the commonly given explanation for the custom of reduction of food intake during the last trimester of pregnancy not only tends to underestimate pregnant women's concern for the health of their babies, but moreover tends to underestimate the pregnant women's concern for their own health.

This brings us back to our research question. We expected that a reduction of food intake would be related to beliefs about eating which in turn would be related to notions of ethnophysiology. Now, we wonder whether the reasons mentioned for a reduction in food intake during the last trimester of pregnancy indeed consist of beliefs which are culturally determined, or whether physiological factors play a role.

If physiological factors do play a role, would not also women in industrialized countries face the same physical problems at the end of pregnancy? None of the scientific reviews mention physiological changes during pregnancy which influence energy intake. However, verbal statements of medical professionals and pregnant women in the Netherlands suggest that similar feelings of unwell-being play a role. At the end of pregnancy the fetus presses against the stomach leaving women with less appetite and more acidity. It would be interesting to study beliefs regarding quantity of food intake during pregnancy among women in the Netherlands as well and compare them with the findings of this study.

The data found by Van Raay *et al.* (1986 and 1987) and Spaay (1993) indicate an average daily increase of 57 kcal. and 44 kcal. respectively during pregnancy. In the latter study, the high variation in change in energy intake during pregnancy indicates that some of the respondents show a reduction in food intake at the end of pregnancy.

Another consideration might be that women in industrialized countries, if they face these kinds of physical problems at the end of pregnancy, are more able to vary the quality of their diet. Women in our study population have little possibilities for variation: they consume the same bulky food every day. It would certainly make a difference whether one can consume, for example, only a little more cream (and reach a certain amount of extra kcal.) instead of one more *rotti*.

As for the social factor related to beliefs regarding quantity of food intake, i.e. the influence of important others, it is evident that almost none of the respondents were told by either their mother-in-law or anyone else to eat less food during pregnancy. It was the respondent's own decision to change energy intake at the end of pregnancy. This is in contrast with what we expected.

Let us compare these beliefs about the quantity of food intake during pregnancy with those about the quality of food intake. Beliefs about what to eat mainly refer to be avoided during

pregnancy. These beliefs are related to classifications of food as formulated in the medical system of Ayurveda. Papaya should be avoided during pregnancy because its heating qualities are supposed to induce an abortion. Other matters which are believed to create heat, like the hot sun, sexual intercourse, allopathic medicines, and working hard should be avoided.

Apart from a spontaneous abortion, food intake during pregnancy is believed to influence the body constitution of the child. Pregnant women should avoid banana, fresh coconut, and sesamum. Consumption of these cooling and oily foods would lead to too much *kapha* in the child's body and cause illnesses like colds, coughs, and pneumonia after delivery. The quality of food intake during pregnancy is thus believed to affect the body constitution of the child. Other behaviour during pregnancy can also influence the health status of the child after delivery. The touch of a menstruating woman during pregnancy, for example, negatively affects health status of the child: it will be small and weak after delivery.

The social factor plays an important role regarding quality in food intake during pregnancy. Especially lower parity women appeared to be influenced by their mother-in-law and their own mother as well.

Summarizing, we can conclude that beliefs about the quality of food intake during pregnancy are related to notions of ethnophysiology, which in turn are related to beliefs regarding other proper behaviour during pregnancy. They are generated from the body of knowledge of which the medical system Ayurveda is most important. Moreover, beliefs of important others are important.

Regarding the quantity of food intake, however, beliefs are related only to notions of ethnophysiology. The influence of important others can be neglected: women themselves decide not to eat more at the end of pregnancy. It remains uncertain whether purely physiological factors play a role: would not also women in industrialized countries face the same physical problems?

In Chapter 1, we stated that the model of nutritional behaviour (see Figure 2.9), derived from the value-expectancy model of Fishbein and Ajzen (1975) not only integrates all variables included in the analysis but also facilitates identification of points of impact for future health education. Given the information above, what are possible points of impacts for health education?

If one aims at improvement of the **quality** of food intake during pregnancy it is evident that food classifications and notions of ethnophysiology as generated by the medical system of Ayurveda should be taken into account. From this study, we know that heating food and food which increases *kapha* in the body of the child should not be recommended. Apart from pregnant women themselves, health education should be aimed at important others like mothers-in-law and mothers.

Regarding the **quantity** of food intake however it does not make sense to aim at beliefs of respondents and important others. Health education could aim at food intake itself and recommend consumption of light foods. As we saw in Chapter 7, one of the respondents

mentioned that she consumed a gruel (*ganji*) of barley rice during pregnancy: it was easy to digest and light for the stomach. When she ate it, she had no heavy stomach and could do the work she had to do.

Here, we come back to the resolution on maternal and child health adopted by the WHO (see Chapter 1), emphasizing the

> "elimination of harmful traditional practices and other social and behavioral obstacles affecting the health of women, children and adolescents".

It decries the persistence of practices

> "such as child marriages, **dietary limitations during pregnancy** and female genital mutilation" (ESCAP, 1993).

Are the beliefs regarding quality and quantity of food intake during pregnancy indeed harmful to either mother or child?

Regarding the quantity of food intake, our study indicates that especially women who are well-nourished before pregnancy are more likely to reduce energy intake. They show a higher level of energy intake at the beginning of pregnancy and reach the same level of energy intake in the last two months of pregnancy on which under-nourished women already existed. This is one of the most important findings of the study, suggesting that the most vulnerable women, i.e. those who are under-nourished before pregnancy, are not likely to lower their energy intake during the last trimester of pregnancy. As became clear in Chapter 6, women in the severe CED group even increased energy intake.

The health condition of women seems to be partly affected by a reduction in energy intake: women who reduced their energy intake by more than 300 kcal. gained significantly less weight in the last two months of pregnancy. However, total weight gain during pregnancy was not affected. In addition, data in this study indicate that birth weight of children born to women who reduce energy intake does not significantly differ from that of children born to women who do not reduce energy intake.

Regarding the quality of food intake during pregnancy we can conclude that the food avoided (mentioned in Chapter 7) are not important food items, and the avoidances do not seem really harmful to either mother or child. However, although the changes taking place during pregnancy might not be harmful, the absolute level of energy intake of women is of course too low, and their diet lacks all kinds of other nutrients, also when they are not pregnant.

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Samenvatting

Zwangerschap in ruraal Zuid India: voeding van vrouwen en welzijn van kinderen

Inleiding

Recentelijk, in 1993, heeft de Wereld Gezondheids Raad (WHO) een resolutie aangenomen betreffende moeder- en kind-zorg. De resolutie richt zich op het bestrijden van

> "schadelijke traditionele gewoonten en andere sociale en culturele obstakels die de gezondheid van moeders, kinderen en adolescenten negatief beïnvloeden".

Men ageert tegen het voortbestaan van gewoontes zoals kinderhuwelijken, beperkingen in voeding tijdens de zwangerschap en vrouwenbesnijdenis (ESCAP, 1993).

Deze resolutie omvat de hoofdvraag van dit onderzoek dat zich richt op voeding tijdens de zwangerschap en gezondheid van moeder en kind in ruraal Zuid India.

Een gewoonte die in veel ontwikkelingslanden bestaat is het verminderen van de voedselinname tijdens de zwangerschap, met name tijdens het laatste trimester. In onderzoeken uitgevoerd in o.a. Kenia, Somalia, Oman, Ethiopië en India wordt het bestaan van deze gewoonte genoemd. In de 19e eeuw verminderden ook vrouwen in de nu geïndustrialiseerde landen hun voedselinname tijdens de zwangerschap. De reden die het meest wordt genoemd voor de gewoonte is dat vrouwen minder eten ten einde een klein kind te krijgen en zo hopen een gemakkelijker bevalling te hebben.

Een dergelijke vermindering van voedselinname tijdens de zwangerschap is in strijd met de internationale aanbevelingen. De FAO/WHO raadt vrouwen aan om tijdens de zwangerschap dagelijks 300 kilocalorieën (kcal.) meer dan normaal te eten.

Gebaseerd op een vooronderzoek (uitgevoerd in oktober 1989) in Dharwad District, Karnataka, India, bleek onderzoek naar de gewoonte van vermindering van voedselinname tijdens het laatste trimester van de zwangerschap in dit specifieke gebied van India zowel wetenschappelijk als maatschappelijk relevant te zijn. Het eigenlijke onderzoek is derhalve uitgevoerd in elf dorpen in Dharwad *taluk* in Dharwad District, in de periode december 1990 tot augustus 1992.

Probleemstelling

In het onderzoek willen we allereerst weten of de genoemde reductie in voedselinname tijdens het laatste trimester van de zwangerschap kan worden aangetoond met gegevens over energie- (kcal.) inname. Eveneens vragen we ons af in welke mate de energie-inname afneemt. Een

volgende vraag is welke vrouwen hun voedselinname verminderen: wordt de gewoonte toegepast door alle vrouwen of alleen door een bepaalde groep van vrouwen?

Ten tweede, verwijzend naar de bovengenoemde resolutie van de Wereld Gezondheids Raad, vragen we ons af of de vermindering in voedselinname tijdens de zwangerschap inderdaad schadelijk is en voor wie het schadelijk is: voor de vrouw, voor het kind, of voor beiden? Met name vragen we ons af wat de effecten zijn wanneer vrouwen wier voedingstoestand al slecht is voordat de zwangerschap begint (zoals bij deze Indiase vrouwen het geval is) hun voedselinname verminderen.

In dit kwantitatief georiënteerde deel van het onderzoek bestuderen we derhalve de effecten van reductie in voedselinname tijdens het laatste trimester van de zwangerschap op vrouwen wier voedingstoestand al slecht is voordat de conceptie plaats vond, op de gezondheidstoestand van vrouwen zelf en op het welzijn van het kind.

Van het kind worden niet alleen het geboortegewicht maar tevens de groei en ontwikkeling in de eerste maand gemeten. Daarmee wordt voortgebouwd op eerder onderzoek dat aantoonde dat, vergeleken met hun leeftijdsgenoten in geïndustrialiseerde landen, kinderen in ontwikkelingslanden meer in gewicht toenemen tijdens de eerste dagen na de geboorte.

Ten derde, de bovengenoemde resolutie dringt aan op het bestrijden van schadelijke gewoonten zoals het beperken van de voedselinname tijdens de zwangerschap. Echter, voedingsgedrag kan alleen veranderd worden (bij voorbeeld door middel van gezondheidsvoorlichting) wanneer men de achterliggende redenen, zoals waargenomen door de vrouwen zelf, kent. Daarom worden in het kwalitatief georiënteerde deel van het onderzoek de ideeën van Indiase vrouwen ten aanzien van voedselinname tijdens de zwangerschap bestudeerd.

Theoretische achtergrond en relevantie

Theoretisch past het onderzoek binnen het model van het ondervoeding-infecties-syndroom, zoals ontwikkeld door Van Norren en Van Vianen (1986). Hun model is een herformulering en verfijning van het gezaghebbende model betreffende kindersterfte in ontwikkelingslanden, namelijk dat van Mosley en Chen (1984).

Terwijl het model van Van Norren en Van Vianen zich richt op kindersterfte (sterfte van kinderen tot vijf jaar), worden hier verschillende perioden onderscheiden met ieder hun eigen patroon van morbiditeit en mortaliteit: de neonatale periode (0-1 maand), de zuigelingen periode (1 maand tot 1 jaar) en de post-zuigelingen periode (1 tot 5 jaar). Gegeven het onderwerp van het onderzoek, richten wij ons op de neonatale periode.

Het 'value-expectancy' model van Fishbein en Ajzen (1975) geeft een structuur waarin ideeën van respondenten, van belangrijke anderen ten aanzien van voedingsgedrag tijdens de zwangerschap en van sociaal-economische en ecologische beperkingen, kunnen worden bestudeerd. Tevens biedt het model de mogelijkheid om aangrijpingspunten voor toekomstige gezondheidsvoorlichting te identificeren. Terwijl Fishbein en Ajzen sociaal-culturele factoren zien als externe variabelen, worden hier deze variabelen expliciet geïncorporeerd in het model. Immers, voedingsgedrag vindt plaats binnen een ecologische, economische en sociaal-culturele context.

Over het algemeen besteden de meeste medische en voedingskundige studies geen aandacht aan de sociaal-culturele context waarin voedingsgedrag plaats vindt. Aan de andere kant besteden de meeste sociaal wetenschappelijke (of antropologische) studies geen aandacht aan het actuele, gemeten voedingsgedrag. Dit onderzoek is een meer holistische studie van voedingsgedrag en zwangerschap: medische, voedingskundige, demografische, sociologische en antropologische aspecten komen aan bod. In die zin kan het onderzoek aangeduid worden als een interdisciplinair onderzoek.

Onderzoeksgebied

Het veldwerk werd verricht in Dharwad *taluk*, Karnataka, India, in de periode van december 1990 tot augustus 1992. Uit de bevolking van elf verschillende dorpen, bestaande uit meer dan 2.000 huishoudens en ongeveer 12.000 individuen, werd de onderzoekspopulatie van zwangere vrouwen geselecteerd.

Het merendeel van de bevolking leeft van de landbouw. 89,4 procent van de huishoudens is Hindu, 9,3 procent is Moslim, 1,0 procent behoort tot de tribale gemeenschap van de Gouli en slechts 0,1 procent (drie huishoudens) is Christen.

Methoden

Methodologisch vereist de vraagstelling van het onderzoek een combinatie van kwantitatieve en kwalitatieve onderzoeksmethoden. Binnen de wetenschappelijke discipline demografie sluit het onderzoek aan bij de micro-benaderingen in demografie, zoals eerder beschreven door Caldwell en anderen. Deze micro-benadering onderscheidt zich van het traditioneel demografische, dat wil zeggen grootschalige survey onderzoek, door toepassing van kleinschalig kwalitatief onderzoek waarbij antropologische onderzoeksmethoden als participerende observatie, diepte-interviews en focus groep interviews centraal staan.

In dit onderzoek werd allereerst een census gehouden in de elf verschillende onderzoeksdorpen. Doel van de census was, naast het leggen van de eerste contacten met de bevolking en het verzamelen van gegevens betreffende de economische en sociaal-culturele context, vrouwen te selecteren die in de komende periode zwanger zouden worden.

Op grond van de gegevens uit de census werden ongeveer 1.000 potentieel zwangere vrouwen geselecteerd die maandelijks werden gevolgd. Data betreffende gewicht, lengte, midden-bovenarm omvang en datum van de laatste menstruatie werden verzameld.

Zodra een vrouw zelf aangaf dat ze zwanger was (meestal in de derde of vierde maand), werd ze geselecteerd en maakte ze deel uit van de onderzoeksgroep. Op deze manier werd een onderzoeksgroep van 186 zwangere vrouwen samengesteld. Gegevens betreffende onder andere voedselinname, gewichtstoename, dikte van huidplooien, anemie, geboortegewicht van het kind en gewicht van het kind na de eerste maand werden verzameld via verschillende surveys. Informatie betreffende de ideeën van vrouwen zelf ten aanzien van voedingsgedrag en ander gedrag tijdens de zwangerschap werd verzameld door middel van participerende observatie en diepte-interviews.

Onderzoekspopulatie

De onderzoekspopulatie bestaat uit 186 zwangere vrouwen. De groep is relatief jong: het merendeel van de vrouwen is tussen de 14 en 24 jaar oud. Hun gemiddelde pariteit is 1,8 en de gemiddelde huwelijksleeftijd 14,5 jaar. In dit laatste cijfer zijn echter kinderhuwelijken verdisconteerd. Het is beter om de gemiddelde leeftijd bij het consumeren van het huwelijk te nemen. Die bedraagt 15,7 jaar.

Het merendeel van de vrouwen behoort tot de lagere sociaal-economische klassen: slechts tien procent leeft in de economisch relatief betere klassen. De religieuze samenstelling van de onderzoekspopulatie reflecteert die van de totale onderzoekspopulatie **en** die van de bevolking in Karnataka en India als totaal. Het overgrote deel is Hindu. Een klein percentage (10,8) is Moslim. Zes vrouwen behoren tot de tribale groep van de Gouli, terwijl één vrouw Christen is. Bij de Hindoes zijn meerdere kasten vertegenwoordigd.

Van deze 186 vrouwen bevielen 175 vrouwen van 176 levendgeborenen (er werd één tweeling geboren). Elf vrouwen kregen een doodgeborene (gedefinieerd als sterfte van de foetus na een zwangerschap van meer dan 28 weken). Dit leidt tot een cijfer van 51,9 doodgeborenen op 1.000 zwangerschappen. De perinatale sterfte (sterfte na 28 weken van de zwangerschap en zeven dagen na de geboorte) is 85 per 1.000 levendgeborenen. 17,7 procent van de vrouwen had ten minste een keer eerder een miskraam of doodgeborene gehad.

De vrouwen in de onderzoekspopulatie zijn klein en licht: het gemiddelde gewicht voor de zwangerschap is 41 kg en de gemiddelde lengte 151 centimeter.

Gebaseerd op James *et al.* (1988) en Kusin *et al.* (1992) worden de vrouwen ingedeeld naar hun voedingstoestand voor de zwangerschap. Aan de hand van de 'Body Mass Index' (BMI) (gewicht / lengte^2 * 100), worden drie groepen van Chronisch Energie Deficiëntie (CED) onderscheiden. In de onderzoekspopulatie bleek meer dan de helft van de vrouwen chronisch energie deficiënt te zijn: 13,0 procent sterk CED (BMI $\leq$ 16,0), 18,3 procent matig CED (16,1 $\leq$ BMI $\geq$ 16,9) en 27,8 procent mild CED (17,0 $\leq$ BMI $\geq$ 18,4). 40,9 procent van de vrouwen is non-CED (BMI $\geq$ 18,5).

Bovendien is 18,5 procent van de vrouwen anemisch (Hb $\leq$ 10,0 g/dl), terwijl 62,3 procent van de vrouwen een Hb gehalte heeft beneden de 11,0 g/dl. Dit laatste cijfer wordt als indicator voor anemie gebruikt door o.a. de WHO en UNICEF.

Resultaten

Voedselinname en effecten op moeder en kind. Het voedingspatroon van de zwangere vrouwen blijkt eenzijdig en, wanneer vergeleken met de aanbevelingen geformuleerd door de Indiase medische raad (ICMR), deficiënt te zijn in voedingsstoffen als proteïnen, calorieën, ijzer en calcium. De meeste vrouwen bereikten niet eens de niveaus van voedselinname die worden aanbevolen voor niet-zwangere vrouwen. Behalve de armoede, spelen ook sociaal-culturele factoren een rol. Vrouwen nemen pas hun voedsel nadat eerst de mannen en kinderen in hun familie zijn bediend. Hen rest derhalve het voedsel dat overblijft. Tijdens de zwangerschap verandert dit voedingspatroon niet. Tevens zijn vooral de jongere vrouwen

afhankelijk van anderen (meestal de mannen, maar soms ook de schoonmoeders) wat betreft voedsel dat op de markt wordt gekocht.

In het kwantitatieve deel van het onderzoek blijkt inderdaad een vermindering van voedselinname tijdens de zwangerschap. Wanneer we een (kleine) groep vrouwen nemen met ten minste drie waarnemingen tijdens de zwangerschap, blijkt een trend van afnemende voedselinname. Terwijl in de derde en vierde maand de energie-inname 1.774 kcal. bedraagt, is die in de vijfde/zesde/zevende maand gedaald tot 1.749 kcal. en in de achtste/negende maand tot 1.662 kcal.

De vermindering van de voedselinname blijkt niet samen te hangen met seizoen-invloeden of economische omstandigheden. Vermindering van voedselinname tijdens de zwangerschap gebeurt gedurende het gehele jaar in zowel de laagste als de hoogste sociaal-economische klassen.

De belangrijkste determinant van verandering in voedselinname blijkt de voedingstoestand van vrouwen voor de zwangerschap te zijn. Vrouwen die niet CED zijn, dus een BMI hebben boven de 18,4, blijken meer geneigd te zijn hun voedselinname te verminderen tijdens het laatste trimester van de zwangerschap. Onder vrouwen die CED zijn, dus een BMI beneden 18,5 hebben, is de gemiddelde dagelijkse energie-inname gedurende de laatste twee maanden van de zwangerschap gelijk aan de voorafgaande maanden: rond de 1.660 kcal. Onder non-CED vrouwen daalt de gemiddelde energie-inname in diezelfde periode van 1.800 kcal. naar 1.630 kcal.

De gemiddelde gewichtstoename van de vrouwen tijdens de zwangerschap bedraagt 6,4 kg. In het onderzoek blijkt dat CED vrouwen meer in gewicht toe te nemen (gemiddeld 7,2 kg) dan non-CED vrouwen (5,2 kg). Hetzelfde resultaat werd gevonden door onderzoekers in Indonesië (Kusin *et al.*, 1992) en Pakistan (Winkvist *et al.*, 1994). Kusin *et al.* concluderen dat

> "in CED women, pregnancy .. promoted weight gain .... " (Kusin *et al.*, 1992, p. 15).

In dit onderzoek is het mogelijk dat non-CED vrouwen minder in gewicht toenemen omdat zij diegene zijn die hun energie-inname verminderen gedurende de laatste twee maanden van de zwangerschap. Echter, de verschillen in gewichtstoename bestaan, onafhankelijk van de energie-inname tijdens de zwangerschap. Niet energie-inname, maar voedingstoestand voor de zwangerschap lijkt gewichtstoename te beïnvloeden.

Een grotere gewichtstoename tijdens de zwangerschap echter betekent niet per se een toename in vet, maar kan ook een teken zijn dat extra water wordt vastgehouden. Misschien nemen CED vrouwen meer in gewicht toe omdat ze eerder oedeem ontwikkelen tijdens de zwangerschap?

Er werd derhalve geen relatie gevonden tussen verandering in energie-inname tijdens de zwangerschap en totale gewichtstoename van de vrouw. Wel vonden we dat vrouwen die hun voedselinname met meer dan 300 kcal. verminderden in de laatste twee maanden van de zwangerschap, minder in gewicht toenamen in deze periode van twee maanden.

De ontwikkelingen in huidplooien van triceps, biceps en subscapular werden eveneens gemeten. Alle drie laten ze een lichte toename zien in de eerste maanden van de zwangerschap en een lichte afname gedurende de laatste twee maanden. Er werd geen relatie gevonden tussen energie-inname tijdens de zwangerschap en de ontwikkeling van huidplooien en midden-boven-arm omvang. Dit zou te wijten kunnen zijn aan methodologische problemen.

Het gemiddelde geboortegewicht van de levendgeborenen bedraagt 2.646 gram. Hun gemiddelde lengte is 47,2 centimeter. 26,1 procent heeft een laag geboortegewicht (< 2500 gram). Meisjes hadden een lager geboortegewicht (2.614 gram) dan jongens (2.682 gram). Eerstgeborenen (primiparae) hebben een geboortegewicht van 2.417 gram, multiparae van 2.696 gram.

Er werden geen significante verschillen in geboortegewicht gevonden tussen CED vrouwen en non-CED vrouwen. Kinderen geboren bij CED vrouwen (BMI lager dan 18.5) hebben een gemiddeld geboortegewicht van 2.619 gram, kinderen bij non-CED vrouwen wegen gemiddeld 2.647 gram.

Evenmin werd een significant verschil in geboortegewicht van kinderen gevonden tussen vrouwen die hun energie-inname verminderden tijdens het laatste trimester van de zwangerschap en zij die dat niet deden. Kinderen geboren bij vrouwen in de eerste groep wogen gemiddeld 2.657 gram, terwijl kinderen geboren bij vrouwen in de tweede groep een gemiddeld geboortegewicht van 2.671 gram kenden.

Vergeleken met hun leeftijdgenoten in de geïndustrialiseerde landen, groeiden de kinderen in de eerste maand na de bevalling inderdaad harder. De groeisnelheid in de eerste maand (gram gewichtstoename per kg lichaamsgewicht per dag) bedraagt 10,3. Bij kinderen in Engeland is dit bij voorbeeld 6,1.

Ideeën van vrouwen zelf: kwaliteit van voedsel. Bij de vrouwen in de onderzoekspopulatie zijn vele ideeën aanwezig over de kwaliteit van voedsel-inname tijdens de zwangerschap en met name over bepaald voedsel dat moet worden vermeden. Papaya bij voorbeeld moet worden vermeden omdat de verhittende kwaliteit van de vrucht zou leiden tot een miskraam.

Het begrip verhittend is gerelateerd aan de classificatie van voedsel in het traditionele medische systeem Ayurveda. Voedsel en andere zaken worden geclassificeerd in binaire begrippen, zoals heet versus koud, licht versus zwaar, nat versus droog, etcetera. Ze hebben invloed op de samenstelling van de drie lichaamssappen in het menselijk lichaam. Volgens Ayurveda bestaat het menselijk lichaam uit drie lichaamssappen, *pitta*, *kapha* en *vata*. In gezondheid zijn deze drie in balans, bij ziekte overheerst een van de drie.

Zwangerschap wordt gezien als een proces van toenemende hitte. Een teveel aan hitte in een vroeg stadium van de zwangerschap zal tot een miskraam leiden. Te veel hitte treedt op door bij voorbeeld het eten van verhittend voedsel (zoals papaya, pepers en vlees), maar ook door te hard werken, de zon, seksuele omgang en allopatische medicijnen. Een teveel van deze zaken dient derhalve vermeden te worden tijdens de zwangerschap.

Van vrouwen die al eerder miskramen, doodgeborenen en misvormde kinderen kregen, wordt gedacht dat ze een verhittende constitutie hebben. Zij nemen vaak een speciale drank (*beevin rasa*), gemaakt van 'neem' bladeren. Het drankje heeft een verkoelend effect op het lichaam.

Ander voedsel dat vermeden wordt omdat het tot een soort van allergische reactie van het lichaam (*barsna)* zou leiden, bestaat uit o.a. banaan, verse kokosnoot en sesamzaad. De verkoelende kwaliteit van dit voedsel en de olie-inhoud beïnvloeden de lichaamsconstitutie van het kind. Wanneer dit soort voedsel wordt gegeten, zal er een teveel aan *kapha* zijn in het lichaam van de foetus, wat zal leiden tot ziektes van het kind na de geboorte. Ziektes als longontsteking, kou en hoesten zijn de gevolgen van zo'n teveel aan *kapha*.

Deze ideeën ten aanzien van voedsel zijn gerelateerd aan ideeën over ander gedrag tijdens de zwangerschap. Enkele voorbeelden. Tijdens een zons- of maansverduistering mogen vrouwen niets doen. Men denkt dat, wanneer een vrouw werkt (bij voorbeeld hout sprokkelt) tijdens zo'n verduistering, het kind zal worden geboren met een gebroken been. Ook hazelippen en andere misvormingen van het lichaam van kinderen worden gerelateerd aan deze verduisteringen. Zwangere vrouwen, naast vrouwen die net zijn bevallen en kinderen, zijn extra kwetsbaar voor invloeden van kwade geesten of het boze oog. De aanraking van een menstruerende vrouw tijdens de zwangerschap kan de gezondheid van het kind eveneens negatief beïnvloeden.

Ideeën van vrouwen zelf: kwantiteit van voedsel. Ten aanzien van de kwantiteit van voedsel tijdens de zwangerschap, rapporteerden iets meer dan de helft van de vrouwen dat ze minder aten aan het eind van de zwangerschap. De andere helft zei dezelfde hoeveelheid voedsel te nemen als normaal. Slechts enkelen (N=7) zeiden dat ze meer aten dan normaal.

De redenen, zoals waargenomen door vrouwen zelf, om minder of even veel te eten aan het eind van de zwangerschap zijn gerelateerd aan de gezondheid van de vrouwen. Zoals de respondenten zeiden: als ze meer zouden eten, zouden problemen als ademloosheid, oprispingen, een te volle maag, vermoeidheid of maagpijn ontstaan. Vrouwen zeiden niet meer in staat te zijn te werken wanneer hun maag vol zat met het kind en voedsel. Het Kannada woord *ekasse* omvat al deze symptomen. In de eerste plaats verminderen vrouwen dus hun voedselinname aan het eind van de zwangerschap ten einde hun eigen gevoel van welzijn te behouden en niet, zoals de meest genoemde reden luidt om geen groot kind te krijgen. Het tegenovergestelde geldt: juist omdat het kind aan het eind van de zwangerschap groot is en meer ruimte inneemt, gaan vrouwen minder eten.

Wat zijn nu de ideeën over de effecten van de kwantiteit van voedsel op het kind? Enkele respondenten zeiden dat minder eten aan het eind van de zwangerschap zou leiden tot een klein kind. Meer vrouwen echter zeiden dat als ze minder aten, het kind zich goed kon ontwikkelen en gezond zou zijn. Dit werd vervolgens gerelateerd aan het idee dat wanneer minder wordt gegeten, er meer ruimte in de maag (hiermee doelen de vrouwen niet zozeer op de maag als wel het gehele gebied van maag/buik/baarmoeder) zal zijn voor het kind om zich te bewegen waardoor het zich beter kan ontwikkelen. Wanneer meer zou worden gegeten, zou het kind in de verdrukking komen, zich niet kunnen bewegen en zich niet goed kunnen ontwikkelen. In enkele gevallen werd een betere ontwikkeling van het kind gelijk gesteld aan groter zijn.

Dit gepercipieerde positieve effect van minder eten op de ontwikkeling van het kind is echter niet de reden om minder of normaal te eten aan het eind van de zwangerschap. Het effect op het kind is een bijkomstigheid. De reden om minder of normaal te eten en niet méér zoals de FAO/WHO aanraadt, is gerelateerd aan de vrouwen zelf: als ze meer zouden eten krijgen ze problemen met hun eigen gezondheid.

APPENDIX A

CASE STUDY 1

Demographic data:	23 years old, parity 2
Caste:	Maratha Kulwadi
Income:	Primary source of income: agriculture; 7 acres cultivated Yearly income: 12,000 rs;
Family:	Joint family, composite household;
Activity:	Housekeeping only
Month of interview:	January

Hour (o'clock)	
5:30	Wakes up and washes her face
5:40	Making tea
6:00	Drinking tea
6:20	Prepare for cooking breakfast (*uppittu)*
6:30	Washing the cooking pots
6:45	Preparing rice
7:00	Washing face of children
7:20	Giving tea to her husband's brothers
7:30	Giving tea and tiffin
8:00	Cleaning utensils used for tea
8:30	Making *rotti*
8:50	Giving the meal to her husband
9:00	Giving the meal to her husband's brothers
9:30	Bringing water from the borewell
10:00	Eating her own meal
10:20	Cleaning the house
10:30	Bathing the children
10:45	Some rest
11:00	Going to the tank to wash the clothes
12:30	Returning home
12:45	Putting clothes outside, to dry
13:00	Some rest
13:20	Giving meal to sons
13:30	Giving meal to husband and husband's brothers
14:00	Taking her own afternoon meal
14:30	Sleeping
15:30	Cleaning rice
15:50	Visiting flour mill, to grind the rice
16:10	Returns home with the rice
16:30	Cleaning rice
17:00	Cleaning the house
17:30	Chatting with husband
17:40	Bringing water from borewell
18:20	Bringing fuelwood from backside of the house to kitchen
18:40	Cleaning the kitchen
19:10	Preparation for the meal
19:30	Preparing tea
19:45	Giving tea to all family members
20:00	Preparing rice
20:10	Giving meal to children
20:30	Making *rotti*
20:45	Making vegetable *bhaji* (curry)
21:10	Giving meal to husband and all other family members
21:40	Eating herself
21:50	Rest
22:20	Playing with son and sleeping

CASE STUDY 4

Demographic data:	22 years old, parity 3
Caste:	Badiger
Income:	Primary source of income: carpentry; secondary: coolie; 2 acres of land are leased out; Yearly income: 1,000 rs
Family:	Nuclear family, composite household
Activity:	Housekeeping and wage labour in the stone quarry
Month of interview:	September

Hour (o'clock)	
6:00	Wakes up Makes some *rangoli* designs in front of her house
7:00	Making tea and drinking it. Starts to prepare the rice, thurdal (*toogare beele)* and *rotti*
8:30	Preparation of food completed
8:45	Eating some *rotti* and cleaning the house Lunch is packed
9:15	Leaving for work, walking half an hour to the stone quarry
10:00	Starting the work: taking stones from the quarry and putting them in a basket and handing them over to the younger girls who transport the stones on their heads to the crushing machine
11:30	Drinking some water and taking some rest
12:00	Starting work again
13:00	Having lunch: *rotti*, rice and *togaare beele* brought from home. Taking rest
14:15	Starting work again
18:00	Work is finished, walking again for half an hour home
19:00	At home, starting to clean, starting the fire in order to make tea. Drinking tea Cooking rice, *toogare beele*, and some curry (*saru*)
21:00	Having meals all together
21:30	Preparing bed: spreading mattresses out
22:00	Sleeping

APPENDIX B

Kannada words and concepts

Aarsna	Turmeric (curcuma domestica)
Aarti	Oil lamps which are lighted and used in *puja*
Adike	Areca-nut
Agni	Literally: fire. Here in the medical system Ayurveda: the all-digesting fire in the human body
Ayasa	Feeling tired, bored
Aidesi	Literally: the fifth day. On the fifth day after delivery a ceremony is performed which marks the end of the pollution period
Alvi ganji	Gruel made of alvi
Amawasya	New moon
Anganwadi	Kindergarten, part of Integrated Child Development Service (ICDS) aiming at nutritional care and health education of pre-school children and pregnant and lactating women
Antu	Gum
Arama	Good, well
Ashakti	Lack of body strength
Atte	Mother-in-law
Avalakki	Beaten rice used to prepare a snack with oil, green chillies, salt and spices
Baike	Special likings
Baale hannu	Banana
Baavu	Swelling on hands, feet or face. Oedema
Bade soppu	Aniseed
Barsna	An allergy, an adverse reaction of the body. Some food items are considered to be *barsna* during a special period, like pregnancy and lactation or an illness
Beevu	Neem
Beevin rasa	Potion made of neem leaves and water. It is intended for women who have had many stillbirths and children with malformations, both related to a heating body constitution. *Beevin rasa* is considered to be cooling (*tampu*)
Benki	Fire of charcoal put under the bed of the wet mother and her child
Bhaji	Curry made of vegetables or pulses
Bhajji beeru	Dried piece of root, tied around the wrist of both mother and child after delivery (commonly on the fifth day)
Bhuta	Evil spirit, malignant spirit or ghost. See also *devva* and *gaali*
Butti	Basket
Burkha	The black dress worn by Muslim women when they go out
Charma (hunnu)	Skin rashes, pimples
Chapati	Kind of pancake, used as staple food, made of wheat flour and oil
Chello	Good
Churidar	Also *salwar kameez*: dress worn by females and consisting of pants and shirt and shawl
Churmari	Puffed rice of which a snack is prepared with oil, green chillies, salt and spices
Dappa	Big or fat

Devva	Ghost, evil spirit; see also *bhuta* and *gaali*
Dhobi	Washerman
Dodakke	Literally: being big. Here: reaching maturity, menarche
Draxi	Grapes
Ekase	Symptoms occurring after eating too much: the stomach is full and problems like breathlessness, pain on the chest, dullness, tiredness, acidity occur
Gaali	Literally: wind. But here: evil spirit, malignant spirit. See also *bhuta* or *devva*
Gadige	Earthen pot. Here: used to bury the placenta
Gadjiga	Fruit grown in the forest and used to wean a child
Ganji	Gruel
Garbha kosha	Uterus in Sanskrit. See also *kusin chilla*
Gensu	Sweet potato
Ginna	Sweet prepared from colostrum of the cow or buffalo. Considered to be special and to be shared with others
Grahana	Eclipse, either of the moon or sun
Gutti batli	Traditionally Ayurvedic medicine. The drops are supposed to be good for young children
Hanchi battu	Tattoo spot, commonly on the forehead of girls
Hadadale	She has delivered
Hasi cobri	Fresh coconut
Hasi may	Status of women after delivery, literally meaning fresh or tender body. Women are isolated, staying in a special room or separated from others in the house by curtains around the bed. Ideally, this period of seclusion lasts for three months
Hasi mensinkai	Fresh green chillies
Hechchige	More
Herige	Delivery
Hesaru beele	Green gram
Horsu	A bed made from wood and thread. Especially made for wet mothers
Hotte	Stomach
Hotte andu	or: *hotte hindu*, *hotte badiyudu*. Illness of the child (after delivery) associated with eating banana and fresh coconut during pregnancy. These food items are believed to lead to too much *kapha* in the body of the child and to illnesses like cough, cold, *pakkadi* and *hotte andu*. Translated as pneumonia. Also mentioned in the villages: *hottin bene* and *hotte rooka*
(Avalu) hottilli adaale	Woman who is pregnant. Literally: she is with a stomach
Hotte hoitu	Spontaneous abortion. Literally: the stomach has died
Hotte kattu	Custom of binding the stomach after delivery
Hotte mugitu	Spontaneous abortion. Literally: the stomach has stopped
Hulsudu	Acidity. Also: *hulli*
Hunnu	Kind of blister on the back of the child. Spina bifida
Hokkala	Umbilical cord
Iddali	Charcoal
Jenu tuppa	Honey

Jiirge	Cummin
Joola	Jowar: sorghum vulgaris
Jvara	Heat in the body
Joolige	Small hammock attached to the *horsu* in which the child sleeps in the first period after delivery
Kadige	Black kohl spots, especially put on the cheeks to protect the child from *kannu*
Kaavu	Heating. In Hindi: *ushna*
Kachcha	A *kachcha* road is a mud road
Kadime	Less
Kai	Raw / unripe fruit
Kamani	Jaundice
Kanya	Astrological sign: Virgo
Kannu	Literally: eye. Here: evil eye. Also *driishti*
Kapha	One of the *tridosha*
Kekkare hannu	Kind of melon
Kemmu	Cough
Kempu gulge	Literally: red tablets, i.e. the iron tablets
Khapsu	Capacity or digestion
Khapsu dilla	No capacity, no digestion
Khara	Chilli
Khar pudi	Chilli powder
Kirani	Grocery shop
Kobri kara	Special dish consumed after delivery, made of dried coconut with sugar or jaggery. According to socio-economic status of the household dried dates, cloves or gum are added
Kubasa	Literally: blousepiece. Ceremony performed during the first pregnancy
Kudugolu	Sickle, used for cutting the paddy. Also used for cutting the umbilical cord
Kumble kai	Pumpkin
Kusu	Baby
Kusin chilla	Literally: bag of the child. Uterus
Kutumba	Family
Ladu	Sweet made especially for women who have delivered. Prepared from heating food like wheat and sugar or jaggery, nuts, dried dates, gum
Lingam	Symbol of Shiva
Maidan	Plateau landscape: a huge plain with some isolated hills. Receives a lower amount of rain per year and is extensively cultivated with crops which differ from those grown in the other region, the *malnad*
Mailige	Pollution
Majjige	Buttermilk
Mala	In the medical system Ayurveda: residual products of the human body like urine, faeces and sweat
Malnad	A rugged landscape with a number of hills at higher elevation, being more forested and receiving a moderate to heavy rainfall per year (see also *maidan*)
Mane	Sitting plank

Mangala sutra	The necklace made of black beads and a golden pendant, marking the marital status of a woman. Also: *tali*
Mannu	Mud
Mantra	Religious verse
Masa	Placenta
Matha	Temple
Matti	Chalk
Mavinkai	Unripe mango
Mavinhannu	Ripe mango
Mensin bakki	Prickly heat
Mensin kai	Green chillis
Menthe palee	Green vegetable: fenugreek
Mosaru	Curds
Mosambi	Sweet lime
Mullah	Muslim priest
Muttu dosha	Children are said to be affected by *muttu dosha*, leading to illness and weakness, if they are touched by a menstruating woman
Nakshatra	Every Hindu month is divided in Nakshatras, a period of fifteen days
Nederu	Black thread put around wrist of child to protect from *kannu*
Oni	Street
Oota	Meal
Paapa	Poor ... in the sence of 'poor you'
Pachana	Digestion
Payasa	Sweet prepared from wheat and sugar
Pakkadi	Ribs, but here associated with the disease *hotte andu*: the stomach below the ribs goes up and down
Pan	Betel-leaf with areca-nut and lime. Sometimes also tobacco is added. Consumed after the meals and said to be good for digestion. In the towns, sweets, honey and special spices are added
Panchanga	The astrological year book released at Ugadi (Hindu new year), valid for the coming year for a certain region
Panchayat	Traditionally the village council. Nowadays an administrative unit
Patti	Rope used during delivery and bound around the stomach of the woman to prevent the child going up
Pitta	One of the *tridosha*
Pucca	A *pucca* road is a paved road
Pushti	Fat
Puja	Worship
Rangoli	Designs of chalk made in front of the house
Rava	Wheat
Rava ganji	Gruel made of *rava* (wheat coarse)
Rotti	Kind of pancake, used as staple food, made of jowar and water
Sajjaka	Sweet made of wheat and jaggery
Sanna	Small
Saru	Sauce
Sautekai	Cucumber

Seebu hannu	Apple
Shawige	Dish made of a kind of vermicelli (wheat) with milk and sugar
Shakti	Body strength
Shenga	Peanut
Shetigevanna vaara	Literally: the day of Shetigaava. On a special night in the period after delivery (often the fifth day) the corridor in the house is kept free for the arrival of the Goddess Shetigaava. When she arrives, she writes the fate of the child on its forehead
Shira	Sweet prepared from wheat and sugar
Sooder maava	Maternal uncle
Sooder maava maga	Cross-cousin along mother's side
Sooder atte maga	Cross-cousin along father's side
Soobhana	Songs sung for women during each 'rite de passage': maturity, marriage and first pregnancy
Sooji	*Rava*
Sulli	Composition of the hair on the back, seen as a sign of whether a child is healthy and will live a long life
Sulgitti	Traditional birth attendant: dai
Sunna	Lime, used with betel-leaf and areca-nut. Also used against acidity
Suttu	A burn
Suttid kale	A mark of a burn, i.e. a birth mark
Swami(ji)	Priest
Taita	Amulet
Taluk	Administrative unit: every district is divided in *taluks*
Tampu	Cooling
Tavaru mane	Mother's or own parents' place
Thoda	Waterpot
Tiffin	Snack
Toogare beele	Thurdal
Tonic gulge	Literally: tonic tablets, i.e. iron tablets
Tottla	Cradle
Tridosha	The three body humours *vata*, *pitta* and *kapha* which, if a person is healthy, are in equilibrium
Ushna	Heating (Hindi) = *kaavu* in Kannada
Uppittu	Tiffin, snack made from *rava* with green chillies, salt and other spices. Also: *upma*
Uppinkai	Pickles made of mango, consumed with the meals
Vata	One of the *tridosha*. Also: *vayu*
Vibuthi	Sacred ash
Wana cobri	Dried coconut
Yeele	Betel-nut leaf, used with areca-nut and lime for a *pan* after finishing meals
Yellu	Sesame. *Bili yellu*: white sesame

APPENDIX C

Local calendar, applied to 1991

Within a Hindu year (which starts with Ugadi), a new month starts the day after new moon day (*amawasya*), includes a full moon (*hunnime*) and lasts until the next *amawasya*. The first period, from the first day after *amawasya* to *hunnime* is called *shukla*, the bright half of the month. The second period is called *krishna*, the dark side of the month. Actually, a double month exists: in 1991, there was one double (*adhika*) and one real (*nija*) Vaishaka.

Month + Date 1991	Local names for new moon (*amawasya*) and full moon (*hunnime*)	Name of Hindu month	Festivals
January 15	Auraatri amawasya	Pushya	14 Makara Sankranti
30	hunnime	Magha	26 Republic day
February 14	Shivaraatri amawasya		12 Maha Shivaraatri
28	Hooli hunnime	Phalguna	28 Hoolie / Kamana habba
March 16	Ugadi amawasya		17 Ugadi
30	Davanada hunnime	Chaitra	30 Hanuman Jayanti
April 14	Akshayatritiya amawasya		
28	(double) Agi hunnime	(double) Vaishaka	
May 14	(double) Badami amawasya		15 Basaveshvara Jayanti
28	(real) Agi hunnime	(real) Vaishaka	
June 12	(real) Badami amawasya		
26	Kar hunnime	Jyeshta	
July 11	amawasya		
26	Guru hunnime	Ashada	
August 10	Nagara amawasya		
25	Mala hunnime	Shravana	15 Independence day 16 Nagara Panchami
September 8	amawasya		
23	Anantana hunnime	Bhadrapada	11 Ganesh festival
October 7	amawasya		2 Mahatma Gandhi Jayanti
23	Seegie hunnime	Ashwayuja	
November 6	Deepavali amawasya		7 Deepavali
21	Gauri hunnime	Kartika	21 Tulsi habba
December 6	amawasya		
21	Horsalu hunnime	Margashira	

APPENDIX D

CENSUS QUESTIONNAIRE

Name of the village _____ Census number _____

Quarter/street _____ Date of census _____

A. INTRODUCTION. Name interviewer _____

B. INFORMATION CONCERNING THE HOUSEHOLD

1. Name of head of the household _____

2 a. What is your religion?

- ☐ Hindu
- ☐ Muslim
- ☐ Jain
- ☐ Other, _____

b To which cast or group do you belong? _____

3 a Which is the Primary source of income of your household? _____

b. Which is the Secondary source of income of your household? _____

4. What is, approximately, the total income per year of your household? Rs _____

a. What is, approximately, your income perday -during raining season? Rs _____

-during wintertime? Rs _____

5 Do you hold land? ☐ Yes ☐ no

a How many acres do you possess yourself? _____ acres

b How many acres are leased out? _____ acres

c How many acres are leased in? _____ acres

d How many acres are cultivated ? _____ acres

e How many acres are wet-land (irrigated)? _____ acres

f How many acres are dry-land (non-irrigated)? _____ acres

6 Do you have a garden or plantation? ☐ yes ☐ no

If yes,

How many acres? _____ acres

7 Do you possess animals? ☐ Yes ☐ no

If yes, - what kind of animals?

-and how many of each?

animal	number
☐ cow	_____
☐ buffalo	_____
☐ bullock	_____
☐ sheep	_____
☐ goat	_____
☐ poultry	_____
☐ other	_____
_____	_____
_____	_____
_____	_____

8 Type of housing:

roof
- ☐ thatched
- ☐ mud and stone
- ☐ tiles — ☐ Black, ☐ red
- ☐ sheets — ☐ asbestos, ☐ tin
- ☐ other _____

walls
- ☐ thatched
- ☐ mud and stone
- ☐ bricks
- ☐ cement
- ☐ other _____

floor
- ☐ mud
- ☐ tiles
- ☐ cement
- ☐ other _____

9 a Is there electricity in the house? ☐ yes ☐ no

b What is your source of Watersupply?
- ☐ Tank
- ☐ well
- ☐ borewell
- ☐ tap- ☐ public, ☐ private
- ☐ other _____

c What do you use for cooking?
- ☐ fuelwood
- ☐ kerosene
- ☐ gas ☐ gober, ☐ cooking
- ☐ other _____

d How many rooms do you have? _____ rooms

Do you have a separate kitchen?		☐ yes	☐ no
Do you have a separate bathroom?		☐ yes	☐ no
Do you have a latrine?	-inside	☐ yes	☐ no
	-outside	☐ yes	☐ no

10 Possessions of the household

Do you have:
- ☐ a bicycle
- ☐ a transistor radio
- ☐ a bullock cart
- ☐ a plough ☐ wooden, ☐ iron
- ☐ a sewing machine
- ☐ a cot
- ☐ table/chairs
- ☐ other _____

C. INFORMATION CONCERNING ALL MEMBERS OF THE HOUSEHOLD

11 How many people are living in your household? _____

Can you please give me the name and some other information concerning all members of your household? (Starting with head of the household) Fill in sheet.

VILLAGE _____ CENSUS NUMBER _____

Name	Relationship to head of the household	Sex	Date of birth	Age	Native place	Marital status	Date of marriage	Age of marriage	Main occupation	Education	Remarks
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

D. DEMOGRAPHIC INFORMATION

13. Is any of the women in the household pregnant at this moment? ☐ yes ☐ no

If yes, - who is pregnant?

-how many months is she pregnant?

Number and name of pregnant woman	Months pregnant
_____	_____ months
_____	_____ months
_____	_____ months

14. Is any of the women in the household breast feeding her child at this moment? ☐ yes ☐ no

If yes, - who is breast feeding?

-how long is she already breast feeding ?

Number and name of woman breastfeeding	Months breastfeeding
_____	_____ months
_____	_____ months
_____	_____ months

15. Does any of the members of the household observe family planning as this moment? ☐ yes ☐ no

If yes, -who does observe family planning?

-Which method of family planning is used?

Number and name of member	Method (sterilization, IUD, pill, condom, copper T other)
_____	_____
_____	_____
_____	_____
_____	_____

16. Did any of the women in the household have a miscarriage or still birth during the last year? ☐ yes ☐ no

If yes, - who had a miscarriage/stillbirth?

-in which month of pregnancy did it occur?

-in which month last year did it occur?

Number and name	Month of pregnancy	Month of the year
_____	_____	_____
_____	_____	_____
_____	_____	_____

17. Were there any children born alive in your household, during the last year? ☐ yes ☐ no

If yes, how many children were born alive? _____ Children

Can you give me - their name

- sex

- date of birth

- number and name of the mother

Name of child	Sex	Date of birth	Number and name of the mother

18. Are all these children still alive? ☐ yes ☐ no

If no, -whom did die?
-in which month did they die?
-what was the cause of death?

Name of child who died	Month of death	Cause of death

19. Were there any other children in your household, who died during the last year? ☐ yes ☐ no

If yes, how many children died? children

Can you give me -their names
-sex
-date of birth
-month of death last year
-cause of death
-number and name of the mother

Name of Child	Sex	Date of birth or age	Month of death	Cause of death	No & Name of Moth

20. Were there other, adult, people in your household who died during the last year? ☐ yes ☐ no

If yes, how many people (adult) did die? people

Can you give me - their names
-sex
-date of birth/age
-month of death last year
-the cause of death

Name	Sex	Date of birth or age	Month of death	Cause of death

E. Conclusion

FORM A

Anthropometric measurements

Village:
Quarter/street: _____

Name of head of the household: _____ Censusnumber: _____
Name of woman followed: _____

A. INTRODUCTION

B. ANTHROPOMETRIC MEASUREMENTS

Date of interview										
1. Height										cm
2. Weight										kg
3. Mid-upper-arm-circumference										cm
4. Skinfold thickness										
a. biceps										
b. triceps										
c. thight										
d. supra-iliac										
e. sub-scapular										
5. Are you pregnant at this moment?										
If yes, in which month?										
6. When did you have your last monthly period?										
REMARKS										

C. CONCLUSION

Village: _____
Quarter/street: _____

Name of head of the household: _____

Name of woman followed: _____

Form B FOOD INTAKE

Date of last period: _____
Month of pregnancy : _____

Censusnumber: _____

Date of interview 1: _____

A. INTRODUCTION

B. FOOD INTAKE 1)

Eating time

Total amount of food intake last day

Food intake pregnant woman last day:

Eating time	Name dish	Ingredient. used	Raw amount (vessel, spoon)	gr / ml	Cooked amount vessel spoon	gr / ml	Raw amount vessel spoon	gr / ml	Cooked amount vessel spoon	gr / ml
Early morning										
Breakfast										
Tiffin										
Meal										
Tiffin										
Meal										
Other (snacks, fruits)										

2. FOOD HABITS

1. In general, do you eat meat? yes no

   If yes, how many times per week/month? _____

   , do you eat eggs? yes no

   If yes, how many times per week/month? _____

2. During these last month(s) of pregnancy, did you avoid certain foods?
   If yes, why did you avoid these foods?

Foods avoided	Reason
_____	_____
_____	_____
_____	_____
_____	_____

3. During these last month(s) of pregnancy, did you add certain foods?
   If yes, why did you add these foods?

Foods added	Reason
_____	_____
_____	_____
_____	_____
_____	_____

3. SOCIETY

FORM C Anthropometry / morbidi

Village:
Quarter/street:

Name of head of the household: Censusnumber:

Name of woman followed: Date of last period:

A. INTRODUCTION

B. ANTHROPOMETRY and MORBIDITY

MONTH OF PREGNANCY

/	3 / 4	5 / 6	7	8	9
Date of interview					
1. Skinfold thickness					
a. biceps					
b. triceps					
c. subscapular					
d. supra-iliac					
e. thight					
2. Did you have any illnesses/diseases during the last month(s) of pregnancy? If yes,					
a. what kind of illness or disease did you have? (symptoms)					
b. how many days were you ill?					
c. did you go to a doctor / health centre / hospital / other?					
d. which medicines did you use?					
3. Did you have a pre-natal check-up?					
If yes, a. where did you go? b. how many times?					
c. did you have any injections? which ones?					
d. did you get any tablets? which ones?					
did you take these tablets?					
4. Anaemia					

Remarks

C. CONCLUSION

FORM D Pregnancy history

Village: _____
Quarter/street: _____

Name of head of the household: _____

Name of woman followed: _____

Censusnumber: _____

Date of interview: _____

A. INTRODUCTION

B. INFORMATION CONCERNING THE WOMAN

1. Date of birth or age: _____
2. Native place: _____
3. Age at menarche: _____

4. Date of marriage or years being married: _____
   if child marriage when actually living together? _____

5. Age at marriage: _____

Remarks: _____

C. INFORMATION CONCERNING EARLIER PREGNANCIES

NO	Date of pregnancy	Age at pregnancy	Ended in	Date	Name of child	Sex	Place of delivery	Home/ Hosp.	Still alive?	If no, date of death	cause death	Remarks
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Remarks: _____

D. INFORMATION CONCERNING THIS PREGNANCY

1. Date of last monthly period: _____
2. Place of delivery: _____

Form E
Activities

Village: _____
Quarter/street: _____

Name head of the household: _____ Censusnumber: _____

Name of woman followed : _____ Date of interview: _____

Date last period: _____
Month of pregnancy: _____

A. INTRODUCTION

B. ACTIVITIES

TIME	ACTIVITY	TIME	ACTIVITY
5:00 am		3:00 pm	
6:00		4:00	
7:00		5:00	
8:00		6:00	
9:00		7:00	
10:00		8:00	
11:00		9:00	
12:00		10:00	
1:00 pm		11:00	
2:00		12:00	

Form F
Attitudes

Village _____
Street _____ Censusnumber _____

Name of head of household _____

Name of woman followed _____

Date of last period _____

I Introduction

1 OPEN

During the former interviews, you said that you avoided during pregnancy (subsequently in the first and second months, the 7th, 8th and 9th month) the FOLLOWING FOOD ITEMS (see CHECKLIST, page 3), for the FOLLOWING REASONS (see CHECKLIST, page 3).

Can you explain this? (e.g. if heating or 'barshna', which food items are considered as heating or barshna and what does it mean? why must they be avoided during pregnancy? etc)

_____
_____
_____
_____

II Intention to behavior

Then,

2 Compared to the amount of food you normally (while not being pregnant) eat, did you
-in general during pregnancy-
eat the same amount, more or less?

__ less
__ normal
__ more
__ don't know

3 Compared to the amount of food you normally (while not being pregnant) eat, did you
-during the first (three) month of pregnancy-
eat the same amount, more or less?

__ less
__ normal
__ more
__ don't know

4 Compared to the amount of food you normally (while not being pregnant) eat, did you
-during the second three month of pregnancy-
eat the same amount, more or less?

__ less
__ normal
__ more
__ don't know

5 Compared to the amount of food you normally (while not being pregnant) eat, did you -during the last (three) months of pregnancy- eat the same amount, more or less?

__ less
__ normal
__ more
__ don't know

6 Why did you eat as normal / less / more?

a. ---

If you did eat as normal or less than normal, why didnot you eat more?

__ food was not available (ecological)
__ could not afford to buy the food (economic)
__ too much food is heating
__ too much food will affect the size of the baby
__ too much food will make the delivery more difficult
__ didnot feel (physically) feel like eating more
__ ekasse
__ other, ---
__ other, ---

If you did eat as normal or less than normal, would you have liked to eat more?

__ yes
__ no
__ donot know

If you did eat as normal or less than normal, would you have been able to eat more?

__ yes
__ no
__ donot know

Why (not)?

---

7 Apart from the fooditems already mentioned (question 1), did you eat normal/less/more of a particular fooditem (e.g. roti, rice, vegetables) during the different trimesters (see CHECKLIST)?

2

CHECKLIST

	1st trim				2e trim				3e trim			
	less	norm	more	no	less	norm	more	no	less	norm	more	no
STAPLE												
roti												
rice												
chapati												
VEGETABLE												
onion												
tomato												
brindjal												
beans												
cucumber												
gourds												
ladyfinger												
chillie												
garlic												
cauliflower												
carrot												
drumstick												
green veg												
potato												
pumkin												
DHAL/GRAM												
dhal												
green gram												
horsegram												
black gram												
bengal gram												
FRUIT												
banana												
coconut												
papaya												
jackfruit												
watermelon												
mango												
guave												
tamarind												
lime												
DAIRY etc												
milk												
meat												
fish												
eggs												
chicken												
ginna												
ghee												
OTHER												
sesamseeds												
jaggery												
dry coconut												
tendercoco												
_____												
_____												

8 OPEN

What were the reasons that you did eat like normal, less or more of especially these fooditems?

a. ----------

III BELIEFS

9 Now, we would like to know your ideas with regard to pregnancy itself and food intake during pregnancy.

What do you think of the following statement:

A By taking care of ones own food intake during pregnancy, one can influence the health of the fetus
(child in stomach)

__ agree
~~__ little bit agree~~
__ donot know
~~__ not really agree~~
__ donot agree at all

made 3 cakequi

If agree, in which way can one influence the health of the child in the stomach?

What do you think of the following statements:

B Eating more a. during whole pregnancy
b. during last months
will have a negative effect on the health of the fetus

__ agree
~~__ little bit agree~~
__ donot know
~~__ not really agree~~
__ donot agree at all

Can you explain this relationship?

The following question focusses on the size of the baby.

C Do you want to give birth to a big, normal or small child?

__ small
__ normal
__ big
__ don't know

Why do you want a big/normal/small child?

What do you think of the following statement:

D By taking care of ones own food intake during pregnancy, one can influence the size of the fetus

__ agree
~~__ little bit agree~~
__ donot know
~~__ not really agree~~
__ donot agree at all

If agree, in which way can you influence the size of the baby?

What do you think of the following statements:

E By eating more a. during whole pregnancy
b. during last months
the child will be bigger

__ agree
~~__ little bit agree~~
__ donot know
~~__ not really agree~~
__ donot agree at all

F By eating more a. during whole pregnancy
b. during last months
the child will be smaller

__ agree
~~__ little bit agree~~
__ donot know
~~__ not really agree~~
__ donot agree at all

Can you explain this relationship?

What do you think of the following statement:

G By taking care of ones own food intake during pregnancy, one can influence the health of the child after delivery

__ agree
~~__ little bit agree~~
__ donot know
~~__ not really agree~~
__ donot agree at all

If agree, in which way can you influence the health of your child after delivery?

What do you think of the following statements:

H Eating more a.during whole pregnancy
b.during lasts months
will have a nagative effect on
the health of the child

__ agree
__ ~~little bit agree~~
__ donot know
__ ~~not really agree~~
__ donot agree at all

Can you explain this relationship?

At time of delivery, a healthy baby is:

__ small
__ normal
__ big
__ don't know

A healthy baby looks like

What do you think of the following statement:

I By taking care of ones own food intake during pregnancy, one can influence ones own health (during pregnancy)

__ agree
__ ~~little bit agree~~
__ donot know
__ ~~not really agree~~
__ donot agree at all

In which way can one influence ones own health during pregnancy?

What do you think of the following statements:

J Eating more a.during whole pregnancy
b.during last months
will have a negative effect
on ones own health

__ agree
__ little bit agree
__ donot know
__ not really agree
__ donot agree at all

Can you explain this relationship?

While being pregnant what is more important for you, the health of your child or your own health? Why?

III SOCIAL NORM

1ØDuring your pregnancy, if you wanted to know something with regard to pregnancy in general, whom did you consult or who did give you advice?

__ mother-in-law
__ mother
__ female family-in-law members
__ female family members
__ neighbours
__ doctor, VHW, nurse
__ other, _____
__ other, _____

If you wanted to know something with regard to what to eat during pregnancy, whom did you consult or whom did give you advice?

__ mother-in-law
__ mother
__ female family-in-law members
__ female family members
__ neighbours
__ doctor, VHW, nurse
__ other, _____
__ other, _____

Can you give me some examples of the advices you got?

According to _____ did you have to
eat a. during pregnancy
b. last months

__ less
__ normal
__ more
__ no opinion

According to _____ did you have to
eat a. during pregnancy
b. last months

__ less
__ normal
__ more
__ no opinion

How important is _____ advice to you?

__ very important
__ bit important
__ indifferent
__ bit unimportant
__ not at all

11 During pregnancy, did you visit a health centre, doctor, etc?

__ yes
__ no

Did they give you an advice - on what to eat?

__ yes
__ no

- on medicines to take?

__ yes
__ no

If yes, what kind of advice did they give?

Did you follow this advice?

__ yes
__ no

Why (not)?

---

12 OPEN The location of the fetus in the stomach. Where is the fetus located? 'Korba kosja' known? Where is the fetus located, in the same place as food?

13 OPEN What happens to body of woman during pregnancy? Increasing heat?

14 OPEN What beliefs concerning other behaviour during pregnancy do exist? (Examples: special puja's, music, songs, photographs, eclips) Do they affect the fetus or yourself?

QUESTIONS LEFT OVER

a When having your meal, what is the order of eating (men first, children, women)?

---

b Who is eating more, you think, men, children, women?

---

c Who does the cooking in your house?

---

d Who is buying the foods at the market place?

---

e What kind of work did you do during pregnancy? In which months?

---

f Did you work outside/on the fields during pregnancy? __ yes
__ no

If yes, until which month of pregnancy did you work there? _____ months

On average, how many days of the week did you work there? _____ months

After that, what kind of work did you do?

---

g How many rice do you yourself harvest per year? _____

Do you eat all this rice? __ yes __ no

How many Jola do you yourself harvest per year? _____

Do you eat all this rice? __ yes __ no

What else, food items, do you grow yourself?

Form G
CHILD

Village: _____
Street: _____ Censusnumber: _____

Name head of household _____ Name woman: _____

Date of last period _____

BIRTH

Date and time of delivery: _____ _____ o'clock

Date and time of interview1: _____ _____ o'clock

Place of delivery (home,hospital): _____

Delivery by (dai, nurse, etc): _____

Complications at delivery? ___ yes ___ no

If yes, which ones?

CHILD

SEX: ___ male ___ female WEIGHT: _____ grammes

HEIGHT: ___ cm HEAD CIRCUMFERENCE: ___ cm

Gestational age,calculated from mentioned last period: ____ weeks

Gestational age,calculated from neurological symptoms: ____ weeks

---

AFTER ONE MONTH Date of interview2: _____

STILL ALIVE? ___ yes ___ no

WEIGHT: _____ grammes HEIGHT: ___ cm

Did the child have illnesses in this first month? ___ yes ___ no

If yes, which ones? ---

Did the child get some medical help in this first month? ___ yes ___ no

If yes, which kind of medical help? ---

Did it use any medicines? ___ yes ___ no

If yes, which one? ---

Did it get any injection? ___ yes ___ no

If yes, which one? ---

NETHERLANDS GRADUATE SCHOOL OF RESEARCH IN DEMOGRAPHY (PDOD)

A joint initiative of:
University of Amsterdam
University of Groningen
University of Utrecht
Catholic University Brabant
Foundation Netherlands Interdisciplinary Demographic Institute (N.I.D.I.)

In May 1993, the World Health Assembly adopted a resolution on maternal and child health, emphasizing the elimination of harmful practices affecting the health of women and children and decrying the persistence of practices like dietary limitations during pregnancy.

This book investigates the reduction of food intake during pregnancy in developing countries. The custom was also observed in nineteenth century Europe. Several authors believe that the reason behind this custom is that women hope to have a small child and thus an easy delivery.

The book documents the extent of dietary limitation during pregnancy in rural South India and assesses whether the limitation is indeed harmful and for who it might be harmful: for the mother, the child or for both. Besides nutritional intake, the book reports on the beliefs of Indian women about food behaviour and other proper behaviour during pregnancy. Their motives behind dietary limitation are different from the one mentioned above.

Data are from fieldwork conducted in eleven villages in the area of Dharwad taluk, Karnataka, India, in the period December 1990 to August 1992.

The study adopts an interdisciplinary perspective: medical, nutritional, sociological, demographic and anthropological aspects of pregnancy, delivery and the postnatal period are studied.

Inge Hutter (1959) graduated in non-western demography and cultural anthropology specializing in medical anthropology. The present research was carried out while she was at the Netherlands Graduate School of Research in Demography (PDOD). She is currently a member of the Population Research Centre of the University of Groningen.

ISBN 90-5170-306-6

9 789051 703061

THESIS PUBLISHERS AMSTERDAM

NUGI 651/733